

HEALTH RESORTS  
OF THE  
CANARY ISLANDS

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J. CLEASEY TAYLOR



The Royal College of Physicians  
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HEALTH RESORTS  
OF  
THE CANARY ISLANDS

# SEAMAN'S HOSPITAL, LAS PALMAS.

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**FOUNDED 1892.**

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*For the admission of Sailors of all Nationalities, who  
through illness may require to be landed  
and left in a foreign country.*

MANAGED BY A COMMITTEE OF BRITISH RESIDENTS,

PRESIDED OVER BY

JAMES MILLER, Esq., H.B.M. VICE-CONSUL.

~~~~~

DURING the first year of its existence thirty-nine patients—the majority British subjects—were admitted, all of whom, with the exception of one hopeless case, were cured and discharged after an average residence of twenty-three days.

The Committee receive from the Vice-Consul two francs per diem—the sum allowed by the British Government—for all sailors who are placed under his charge, and who may be inmates of the Hospital.

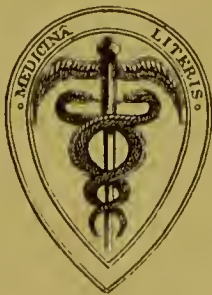
In those cases which do not come under this regulation the sum of three francs a day is charged, where possible, to the ship's account, otherwise the whole burden falls on the Hospital fund.

The actual cost of food for each inmate is slightly over two francs per diem, and the extra expense of rent, nurse, servants, food, drugs, dressings, &c., has to be borne by the Hospital fund, which is supported by voluntary subscriptions and guaranteed by a small British community.

THE  
HEALTH RESORTS  
OF  
THE CANARY ISLANDS  
IN THEIR  
CLIMATOLOGICAL AND MEDICAL ASPECTS

BY  
J. CLEASBY TAYLOR, M.D. EDIN., M.R.C.S. LOND.  
✓ CON TITULO ESPAÑOL  
LAS PALMAS

AUTHOR OF 'GRAND CANARY, ITS CLIMATE AND SPRINGS.'



LONDON  
J. & A. CHURCHILL  
11, NEW BURLINGTON STREET  
1893

## CRUELTY TO ANIMALS.

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The horses, mules, and asses, brought for the use of tourists in the islands, are often in a most wretched condition from sores, under-feeding, and over-driving. British travellers are therefore earnestly requested, as the only valid means of abating this persistent cruelty, to examine all animals before engaging them. It is especially necessary to cause the saddles to be removed.

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## PREFACE

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THE original of this work was a thesis presented to the Medical Faculty of the University of Edinburgh for the Degree of Doctor of Medicine, and which obtained the prize of a Gold Medal.

Owing to lack of technical knowledge, information on the subject of the following work has been of a vague, often erroneous character. There are many who, having read the numerous rhapsodies on the abode of the blessed, come, expecting marvellous and wonderful things, forgetful that the first Paradise was not perfect, for we know that therein dwelt at least one evil thing. These people of necessity are disappointed, as, like every other mundane place, the Canary Islands do possess disadvantages, though the excellence of the climate plays the *rôle* of charity in covering much.

These vague contradictory statements are not confined to the outer world. On arriving at the Islands, visitors will find the pendulum swing to the other extreme, and will be confused by hearing from some, strange and alarming reports of the extensive growth of Upas trees which throw their deadly shadow everywhere, except a few highly favoured spots, in which they may have special interest.

Five years' meteorological observations are rather few from which to draw conclusions, yet they are a contribution towards the forming of a standard by which differences in

climates may be compared and an answer may be given to the common question—Which climate do you consider to be the best?

The information contained may be dry and uninteresting, yet if it tends to throw more light on the subject of these resorts in their relation to health, the object of the book will have been attained.

This work does not pretend to be a guide book in the ordinary acceptation of the term. The best one for excursions, hotels, and steamship communications, is by Samler Brown, entitled 'Madeira and the Canary Islands.' Mrs. Stone, in 'Teneriffe and Her Six Satellites,' gives an interesting account of her own travels in the islands before they were visited by tourists.

J. CLEASBY TAYLOR.

TRIANA, LAS PALMAS;  
*August, 1893.*

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# CANARY ISLANDS.

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## SECTION I.

### HISTORY.

THE history of the Canary Islands is lost in the mists of mythology. For αἱ τῶν μακάρων νῆσοι (the Islands of the Blessed) of the Greeks, and the Insulæ Fortunatæ of the Latins, play an important part in the imaginations of the old writers. Situated as they were beyond the pillars of Hercules, on the extremity of the earth, near the river Oceanus, they were the land of the setting sun, where he sank into that unknown and unnavigable sea, on which if any man ventured he never returned. To these islands the souls of favoured heroes, like Menelaus, were, without dying, transported to join the blessed, and with them to enjoy the pleasures of eternal life in the Elysian fields, where they are fanned by delightful breezes, and where neither the wind nips, nor snow nor rain falls; whence all disease, old age, and death are banished, and where, in the bright sunshine, man follows his own inclination, doing what seemeth right in his own eyes without fear of evil to come.

In these western regions Atlas, for having warred against Zeus, was doomed to support the heavens on his shoulders; and his daughters, "the Hesperides," with the dragon Ladon, kept watch over the golden apples given by Ge to Hera, but Hercules slew the dragon and carried away the spoil. Ulysses also, for putting out the eye of Cyclops, the son of Poseidon (the Neptune of the Romans), was driven by the infuriated god into the midst of the Mare Tenebrosi, on



the extreme west of the world, and was wrecked on the Island of Ogygia, where dwelt the beautiful and astute Calypso, the daughter of Atlas.

The earliest history of the islands may have been associated, as Plato, in his 'Timæus,' makes Critias recount to Socrates, with a large island or continent, the submerged Atlantis, though the consensus of modern opinion is against this theory. They may have been explored and colonised in the time of Sesostriis, king of Egypt (1500 B.C.), and visited by the Tharshish navy of king Solomon.

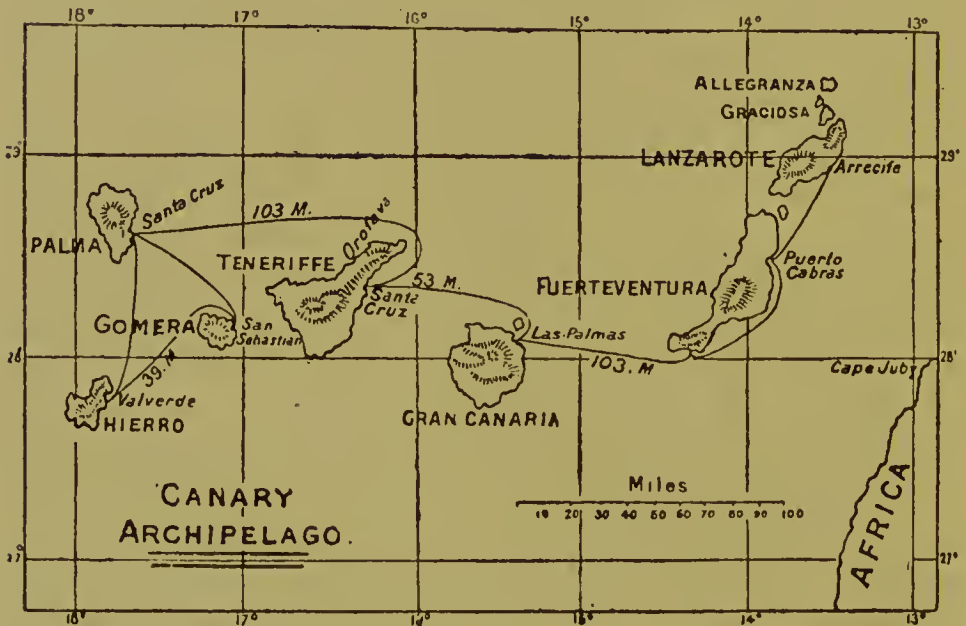
All these speculations are outside the scope of this brochure; it is sufficient to say that there can be no doubt the islands were known to the old Phœnician sailors, and that their strange tales of climate, products, &c., were woven by poetic thought into legends and traditions.

As the Roman Empire expanded, these islands came under their notice, perhaps through the tales of Carthaginian sailors taken captive in the Punic wars. According to Pliny (Book VI, xxxviii), Status Sebosus, about 45 B.C., explored the islands, named them, and recorded their position. Juba II, king of Mauritania, also about this time despatched ships to visit them, and reported to Augustus Cæsar that they were clothed with fire. He sent to Rome a present of two huge dogs obtained from one of the islands, and on this account the island was called Canaria, which name it not only bears at the present time, but the name has spread and embraces the whole group (Islas Canarias of the Spanish), displacing the more ancient name *Insulæ Fortunatæ*. The Roman Empire fell, and with it disappeared all knowledge of these islands, and they once more became a story of tradition.

In the fourteenth century they were rediscovered by the Portuguese, then the great maritime nation. In 1344 the first expedition was fitted out, being followed by others from France, Normandy, and Spain. Finally, in 1496, Spain completed the conquest, subduing the original inhabitants (see Appendix). Since that time they have always remained Spanish possessions, though they have been the scene of many naval encounters. In 1595 Sir Francis Drake with Sir John Hawkins was repulsed off Las Palmas and the island of

Gomera; in 1657 Admiral Sir John Blake attacked Santa Cruz de Tenerife; in 1706 Admiral Jennings paid a visit to the group; in 1743 Admiral Charles Winter attacked several of the islands. Finally, in 1797, Admiral Nelson led an assault on Santa Cruz de Tenerife, and whilst standing on the mole his arm was shattered by a cannon shot fired from one of the forts. A prominent figure in the history of the last century is George Glas, a native of Scotland, who in 1764 A.D. attempted to start a fish-curing station on the neighbouring coast of Africa. For this he was thrown into prison at Santa Cruz de Tenerife, where he lay for a year. Liberated, he sailed home; but when in sight of England he, with his wife and child, was murdered in a mutiny. He appears to have been a very observant, clever man, and whilst in prison he translated an old MS. on the Canary Islands which is the source of the greater part of the ancient history of the islands. Since the time of the first Spanish settlers the islands have been more or less noted for their produce. In the latter part of the fifteenth century sugar-cane was extensively planted with the aid of negro labour, competing with Madeira, then the principal producer. In the sixteenth century the production decreased, being unable to compete with the West Indies. In the early part of this century the vine was brought from Madeira, where it had been introduced by Prince Henry of Portugal from the famous vineyards of Malmsey and Malvasia in Crete. For a long period the wine made from this grape was in great request. Thus Shakespeare puts into the mouth of the host of the Garter Inn, "Farewell, my hearts; I will to my honest knight Falstaff, and drink canary with him." Till 1850 this vine continued to grow, fruiting freely, but it was then attacked nearly to extermination by the ravages of the *Oidium Tuckeri*. This particular variety has not been replanted, but is replaced by other vines. In 1826 the cochineal insect was introduced into the islands, when it was found the insect thrived on the *Cactus Opuntia*. From 1830 to 1869 the increase in prosperity consequent on this cultivation was out of all proportion to the number of inhabitants, but the discovery and subsequent development of aniline dyes drove, to a great extent, the cochineal out of the market. In 1884 the

principal ports of Grand Canary and Teneriffe commenced to develop as coaling stations for ocean-going steamers. Following in the train of this increased shipping communication commenced the cultivation of bananas, tomatoes, potatoes, oranges, &c., for exportation mainly to the English markets, and, last of all, the opening up of the islands as health resorts.



## SECTION II.

### GEOGRAPHICAL AND PHYSICAL FEATURES, AND THEIR RELATION TO THE CLIMATE.

THE islands of the Canary Archipelago, situated between  $28^{\circ}$  and  $29^{\circ}$  north, and  $13^{\circ}$  and  $18^{\circ}$  west, extend over a much greater area in longitude than in latitude. In considering the climate no notice need be taken of the slight difference in latitude. If the islands had been situated in mid-ocean, the difference in longitude might also have been ignored, but the fact that the most eastern islands extend to within sixty miles of the coast of Africa (behind which lies the Sahara), and the most western are three hundred miles away, considerably modifies not only the climate, the aspect, the flora, the produce, but also the customs and habits of the islanders themselves.

*Lanzarote* and *Fuerteventura*, the two most eastern islands, have large tracts of land covered either with yellow sand or with lava cinders. In the latter island there is less verdure than in any other; there are no forests, very few trees, and springs of water are so limited that cultivation is dependent on the precarious rain supply, and is naturally confined to those crops that do not require much water, such as barley, wheat, and the cactus for cochineal. The flora are minute, allied to that of the African coast, and may be described as a miniature reproduction. In bad (dry) seasons it has been necessary for large numbers of the population to temporarily emigrate with their cattle to the more western islands. The southern part of *Lanzarote* is similar to the former island. In the northern part there are springs of water, in the vicinity of which onions, potatoes, and tomatoes are grown to perfection. In other parts, where water is scarce, cereal crops



dependent on the precarious rain supply are raised during the winter months.

The western group of islands, *La Palma*, *Gomera*, *Hierro*, are well wooded, covered with vegetation, and produce bananas, figs, peaches, cotton, sugar, silk, &c. The island of *Hierro* differs from the other two in possessing no springs of water, and the inhabitants are dependent on the rain supply both for domestic and agricultural purposes.

In the island of *Teneriffe* the north-western side is much more fertile than the eastern; springs of water are more abundant, and the rainfall being heavier, the land is not dependent on irrigation. The eastern side is more allied to *Grand Canary* in its crops. More cochineal is produced, more cactus and cereals are grown; where water is available for irrigation bananas, tomatoes, potatoes, are also reared.

In the island of *Grand Canary* large tracts of land round the coasts are barren, and cannot be cultivated, owing to the scarcity of water, though in some parts a cereal crop may be grown during the winter months where water is available for irrigation. It is stored in large tanks, in the vicinity of which bananas, tomatoes, &c., are cultivated. Inland, where there is less necessity for irrigation and water is more abundant, sugar-cane, sweet potatoes, grapes, &c., are grown in large quantities.

In considering the question of climate, the proximity to the African coast, though the most important, is not the only factor; the height of the mountain ranges must be also taken into account. The rainfall, sunshine, clouds, &c., stand in direct relation to the proximity and altitude of the mountains; and, in addition, the lee side of the mountain ranges possesses a finer, drier climate than the windward (see "Winds"). The following table indicates to a certain extent these two factors:

| Island.             | Altitude.      | Climate.                                                       |
|---------------------|----------------|----------------------------------------------------------------|
| Lanzarote . . .     | 2,244 feet ... | Dry.                                                           |
| Fuerteventura . . . | 2,770 „ ...    | Dry.                                                           |
| Grand Canary . . .  | 6,400 „ ...    | Dry, moderately.                                               |
| Teneriffe . . .     | 12,180 „ ...   | { East slope dry, moderately.<br>West slope humid, moderately. |
| Gomera . . .        | 4,400 „ ...    | Humid, moderately.                                             |
| Palma . . .         | 7,730 „ ...    | Humid, moderately.                                             |
| Hierro . . .        | 4,400 „ ...    | Humid, moderately.                                             |



Another factor is the amount of vegetation. This increases with the distance from the African mainland, and in its turn no doubt increases the rainfall.

The main physical features have, to some extent, been indicated, but there are two others to be noted, common to all the islands; these are the traces of volcanic eruptions, and the number of deep ravines that run from the mountains to the sea (barrancos). Volcanic activity has ceased for many years, but at the base of the cone of the peak of Teneriffe and in the Monte de Fuegos, in Lanzarote, the ground is still so hot that the heat will boil water and cook eggs. The dates of eruptions in modern times are as follows :

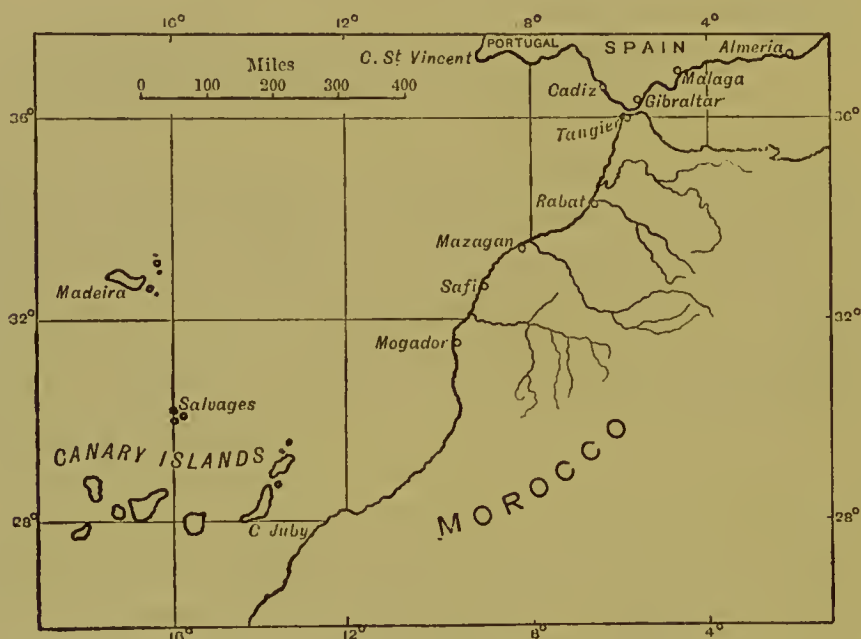
|                                     |                                      |
|-------------------------------------|--------------------------------------|
| In the island of La Palma . . . . . | 1585 and 1677 A.D.                   |
| „ „ Teneriffe . . . . .             | 1705 (Guimar) and 1706 (Garachico) „ |
| „ „ Lanzarote . . . . .             | 1730, 1733, 1765, and 1823 „         |

In the island of La Palma there is an enormous crater, with its breach to the western side; it is 6780 feet deep, and from five to seven miles wide. In all the islands extinct craters, streams of lava, cinders, &c., are to be seen; sometimes a stratum of lava beneath strata of alluvial clay, in which are embedded huge boulders of a blue lias, this in its turn covered by another stratum of lava, perhaps honeycombed in character. The sand of the sea, except in two or three regions, is of a black volcanic nature. Near the summit of the Peak of Teneriffe large quantities of pumice-stone are found, associated with sulphur. Limestone has only been found in Lanzarote and in the south of Grand Canary.

The barrancos of the eastern islands are usually bare of trees, though they may be cultivated along the bottom, where the soil is of a rich alluvial nature; those of the western islands are more or less clothed with trees, scrub, verdure, &c.; those of Hierro are short and precipitous, as the island is somewhat of a table-land.

A difference in the temperature of the sea has been stated to affect the climate of the various islands. As will be seen, the temperature of the sea at Grand Canary did not vary from that of the western islands, whilst it was nearly one degree higher than at the eastern islands of Lanzarote and Fuerte-

ventura. There is a current of water, varying in breadth, running southward along the African coast, which has a much lower temperature, from ten or more degrees below that of the ocean, but it is scarcely felt at the eastern islands of Lanzarote and Fuerteventura. In this current fishes that inhabit more temperate waters are found, which are not found in the seas around the islands. The catching and salting of these fish form a staple industry, of which Grand Canary is the main depôt. This cold-water current and its inhabitants have been made a subject of special study by Dr. Enrique Stassano, of Las Palmas.



### SECTION III.

METEOROLOGY—WINDS—TEMPERATURES—HUMIDITY—RAINFALL  
—SUNSHINE—ATMOSPHERIC PRESSURE, &c.

*Meteorology.*—This has been unsatisfactorily recorded, the data being scanty and often unreliable. The position of the instruments must considerably modify the results. Take, for example, the position of the thermometers, the readings of which in the same locality are made by visitors to vary in an astonishing manner. The following readings were taken at 9.30 a.m. on June 23, 1893 :

|                                           |   |   |   |          |
|-------------------------------------------|---|---|---|----------|
| Shade temperature in Stevenson's screen   | . | . | . | 75·5° F. |
| „ „ in a north window                     | . | . | . | 78·5° F. |
| Temperature within the house              | . | . | . | 76·5° F. |
| „ in sun and wind                         | . | . | . | 88·0° F. |
| „ in the sun, but sheltered from the wind | . | . | . | 99·5° F. |

The position of the thermometer affects not only the temperature, but the humidity which is calculated from it, the same thing applies in an equal degree to the position of the rain-gauge.

For this reason, unless there is one general plan adopted and continued, there will continue to be a number of varying results. The most complete set of observations are those observed in Las Palmas, Grand Canary. Owing to its position, this town is more free from purely local influences than any other part, so that I will take the observations recorded by myself as the type of climate, and will then give those data that are obtainable for other places. These observations have been taken regularly at the hours indicated during the past five and a half years, 1888 to the end of May, 1893, with the exception of the months of June, July, and September, which are for three years only (1890—1892). Those for

August are for 1891 and 1892, though the winds and humidity in that month were observed during 1891 only. In any insular climate where the island is of small extent the most important element must be the winds, and in this region the most frequent are those from the northern direction. In the following table I have combined the directions N.W., N., N.E. into one table, as there is no great difference in the weather, and also it obviates a multiplication of statistics.

*Number of occasions wind observed from the northern direction.*

| Means.     | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|--------|
| 9 a.m. . . | 14·8 | 14·2 | 19·4 | 26·0   | 27·0 | 28·6  | 30·0  | 30·0 | 24·6  | 21·5 | 21·0 | 18·0 | 276    |
| Noon . . . | 13·7 | 13·5 | 20·2 | 25·4   | 27·5 | 29·6  | 30·0  | 29·0 | 27·3  | 23·0 | 22·0 | 18·0 | 279    |
| 9 p.m. . . | 15·0 | 15·6 | 20·8 | 25·6   | 27·2 | 29·3  | 28·3  | 29·0 | 20·6  | 17·0 | 18·4 | 17·8 | 264    |

The north-west wind is not of much importance : during the summer months it is rarely recorded ; during the winter it may occasionally blow for a whole day ; sometimes, if prevailing early in the morning, it veers later to the north or north-east. The north and north-east winds form the main constituents of this table, and prevail not only through the day but also during the night, though during the evening they may veer a few points towards the north-west. The force usually diminishes after sunset, and does not increase till some hours after sunrise.

The time of the greatest continuity of these winds, especially the north and north-east, coincides with the period of little rain. It is, however, with the wind from this direction that the majority of the days are associated on which rain falls during the winter season. It may be generally stated that the stronger the wind is from this quarter, there are the more probabilities of unsettled weather, accompanied by short showers of rain. The weather before and after is fine.

To illustrate these two periods I have taken two sets of days ; the one for January is perhaps a little exaggerated in the matter of rainfall (see Table, p. 11).



*Examples of weather in January and June with northern winds.*

WINDS.

11

| 1892.<br>January. | Wind.      |        | Sea.     | Shade temp.    |                | Rainfall,<br>inches. | Sunshine. |      | 1891.<br>June.    | Wind.      |        | Sea.     | Shade temp. |       | Rainfall,<br>inches. | Sunshine. |      |
|-------------------|------------|--------|----------|----------------|----------------|----------------------|-----------|------|-------------------|------------|--------|----------|-------------|-------|----------------------|-----------|------|
|                   | Direction. | Force. |          | Max.           | Min.           |                      | Hrs.      | Min. |                   | Direction. | Force. |          | Max.        | Min.  |                      | Hrs.      | Min. |
| 16th              | S.E.       | 2      | Swell    | Fahr.<br>71·0° | Fahr.<br>56·5° | —                    | 6         | 20   |                   |            |        |          | Fahr.       | Fahr. |                      |           |      |
| 17th              | N.W.       | 5      | Rough    | 68·0°          | 58·5°          | ·050                 | 5         | 20   | 1st               | N.E.       | 3      | Slight   | 73·5°       | 66·5° | Nil                  | 5         | 50   |
| 18th              | N.W.       | 3      | Moderate | 65·0°          | 58·5°          | —                    | 7         | 40   | 2nd               | N.E.       | 2      | "        | 72·0°       | 64·5° | "                    | 11        | 30   |
| 19th              | N.-N.E.    | 3      | Swell    | 66·5°          | 59·5°          | —                    | 7         | 30   | 3rd               | N.         | 2      | Moderate | 73·0°       | 65·0° | "                    | 11        | 40   |
| 20th              | N.-N.E.    | 3      | Moderate | 66·5°          | 60·0°          | ·110                 | 4         | 40   | 4th               | N.N.W.     | 3      | "        | 73·5°       | 64·5° | "                    | 6         | 30   |
| 21st              | N.-N.E.    | 4      | "        | 66·5°          | 56·0°          | ·060                 | 4         | 50   | 5th               | N.         | 3      | "        | 73·0°       | 64·5° | "                    | 6         | 10   |
| 22nd              | N.-N.E.    | 4      | Rough    | 64·0°          | 57·0°          | ·430                 | 5         | 30   | 6th               | N.-N.E.    | 3      | "        | 72·5°       | 64·5° | "                    | 11        | 50   |
| 23rd              | N.         | 3      | Moderate | 64·5°          | 58·0°          | ·040                 | 5         | 30   | 7th               | N.-N.E.    | 3      | "        | 73·5°       | 66·5° | "                    | 8         | 0    |
| 24th              | N.-N.E.    | 3      | "        | 66·5°          | 59·0°          | ·070                 | 7         | 20   | 8th               | E.N.E.     | 2      | "        | 75·0°       | 65·0° | "                    | 10        | 10   |
| 25th              | N.         | 2      | "        | 63·5°          | 58·5°          | ·320                 | 5         | 0    | 9th               | N.         | 3      | "        | 73·5°       | 65·5° | "                    | 4         | 10   |
| 26th              | N.-N.E.    | 3      | "        | 65·5°          | 57·5°          | ·060                 | 5         | 20   | 10th              | N.-N.E.    | 3      | "        | 73·5°       | 67·5° | "                    | 2         | 30   |
| 27th              | N.E.       | 2      | "        | 67·0°          | 57·5°          | ·100                 | 2         | 20   | 11th              | N.N.E.     | 4      | "        | 71·5°       | 66·5° | "                    | 0         | 40   |
| Average for month |            |        | .        | 68·5°          | 58·7°          | 2·105                | 5         | 32   | Average for month |            |        | .        | 74·6°       | 66·8° | Nil                  | 7         | 56   |



A wind from the eastern direction is almost entirely absent from June to October. Through the winter months it prevails occasionally for a day or two at a time, but its force is not strong; at sunset it dies down, and either there is a calm or a land breeze from the west springs up.

*Number of occasions wind observed from the eastern direction.*

| Means.     | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|--------|
| 9 a.m. . . | 2·8  | 4·2  | 3·0  | 1·2    | 2·2  | ·3    | ·6    | ·3   | ·6    | 2·6  | 3·2  | 4·6  | 26     |
| Noon . . . | 3·0  | 4·5  | 5·2  | 1·0    | 2·0  | Nil   | ·6    | ·3   | ·3    | 1·5  | 4·0  | 5·0  | 27     |
| 9 p.m. . . | ·6   | ·6   | ·4   | 0      | 0    | Nil   | Nil   | Nil  | ·3    | ·8   | ·6   | 1·0  | 4      |

This wind approximates as a general rule more to the southern winds than the northern in regard to sunshine, range of temperature, and absence of rain.

*Effect of east wind on sunshine and temperature.*

|       |          | Wind.      |       | Shade temp. |             | Rain-fall. | Sunshine. |      | Humidity (Sat.=100). |       |        |        |
|-------|----------|------------|-------|-------------|-------------|------------|-----------|------|----------------------|-------|--------|--------|
|       |          | Direction. | Force | Max.        | Min.        |            | Hrs.      | Min. | 9 a.m.               | Noon. | 3 p.m. | 9 p.m. |
| 1889. | Jan. 27  | E.         | 0-1   | Fahr. 69·5° | Fahr. 58·5° | Nil        | 9         | 0    | 59                   | 62    | 62     | 79     |
| "     | Feb. 17  | E.         | 0-1   | 69·0°       | 58·0°       | "          | 10        | 20   | 55                   | 58    | 56     | 81     |
| 1890. | May 8    | E.         | 0-1   | 71·5°       | 57·0°       | "          | 9         | 0    | 54                   | 59    | 64     | 70     |
| "     | " 9      | E.         | 0-1   | 71·5°       | 59·0°       | "          | 12        | 40   | 65                   | 57    | 66     | 59     |
| 1891. | March 20 | E.         | 1-2   | 70·0°       | 60·5°       | "          | 7         | 20   | 68                   | 56    | 68     | 80     |
| "     | " 27     | E.         | 0-2   | 72·0°       | 57·5°       | "          | 10        | 40   | 52                   | 55    | —      | 59     |
| 1892. | April 6  | E.         | 0-1   | 71·0°       | 57·0°       | "          | 9         | 50   | 69                   | 61    | —      | 78     |
| 1893. | March 11 | E.         | 0-1   | 72·0°       | 58·0°       | "          | 10        | 10   | 70                   | 63    | —      | 80     |

Very occasionally there may be recorded a wind from the east that is apparently only local. This will be again referred to.

A wind from the southern direction (S.E.—S.) is also much rarer during the summer than the winter months.

*Number of occasions wind observed from the southern direction.*

| Means.     | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|--------|
| 9 a.m. . . | 8·4  | 5·0  | 4·4  | 1·0    | 1·0  | Nil   | Nil   | Nil  | ·3    | 3·4  | 2·6  | 4·4  | 31     |
| Noon . .   | 7·5  | 8·2  | 5·2  | 2·0    | ·6   | Nil   | Nil   | Nil  | ·6    | 3·2  | 2·2  | 4·7  | 34     |
| 9 p.m. . . | 2·5  | ·6   | 1    | 0      | 0    | Nil   | Nil   | Nil  | Nil   | ·2   | ·6   | ·2   | 4      |

It is usually characterised by higher range of temperature, absence of rainfall, a low degree of humidity, and a cloudless sky.

*Examples of weather during south wind.*

|               | Wind.      |       | Shade temp. |             | Rain-fall. | Sunshine. |      | Humidity (Sat.=100). |       |        |        |
|---------------|------------|-------|-------------|-------------|------------|-----------|------|----------------------|-------|--------|--------|
|               | Direction. | Force | Max.        | Min.        |            | Hrs.      | Min. | 9 a.m.               | Noon. | 3 p.m. | 9 p.m. |
| 1890. Jan. 23 | S.E.       | 1-2   | Fahr. 67·5° | Fahr. 55·5° | Nil        | 9         | 50   | 55                   | 54    | 62     | 81     |
| " " 24        | S.S.E.     | 1-2   | 70·0°       | 57·5°       | "          | 9         | 0    | 54                   | 50    | 60     | 82     |
| " " 25        | S.S.E.     | 1-2   | 69·0°       | 59·0°       | "          | 9         | 50   | 52                   | 62    | 60     | 71     |
| 1891. Jan. 27 | S.E.       | 2     | 67·5°       | 55·0°       | "          | 10        | 10   | 60                   | 60    | 60     | 70     |
| " " 28        | S.S.E.     | 1     | 69·0°       | 56·5°       | "          | 10        | 10   | 62                   | 62    | 51     | 81     |
| " " 31        | S.E.       | 1-2   | 71·0°       | 57·5°       | "          | 9         | 30   | 67                   | 49    | 62     | 81     |
| 1892. Oct. 28 | S.E.       | 1     | 80·0°       | 63·5°       | "          | 10        | 0    | 59                   | 57    | —      | 85     |

This wind, however, may possess a moist character, with cloudy sky and even rainfall, although it is most unusual. As an example I give five days.

*South wind with moist weather.*

|              | Wind.      |       | Shade temp. |             | Rain-fall. | Sunshine. |      | Humidity (Sat.=100). |       |        |        |
|--------------|------------|-------|-------------|-------------|------------|-----------|------|----------------------|-------|--------|--------|
|              | Direction. | Force | Max.        | Min.        |            | Hrs.      | Min. | 9 a.m.               | Noon. | 3 p.m. | 9 p.m. |
| 1892. Dec. 4 | S.E.       | 2     | Fahr. 72·0° | Fahr. 61·5° | ·210       | 6         | 0    | 80                   | 76    | —      | 80     |
| " " 5        | S.E.       | 3     | 72·5°       | 65·5°       | ·240       | 6         | 50   | 73                   | 73    | —      | 85     |
| " " 6        | S.-N.E.    | 1     | 71·0°       | 66·0°       | ·030       | 0         | 0    | 83                   | 83    | —      | 73     |
| " " 7        | E.         | 0     | 74·0°       | 66·0°       | —          | 1         | 20   | 79                   | 72    | —      | 78     |
| " " 8        | S.E.       | 1-2   | 74·5°       | 65·0°       | —          | 5         | 0    | 71                   | 77    | —      | 83     |

The causes of the difference are rather difficult to state, but the little evidence at hand indicates that this moist south wind is of a local character due to local disturbances, and

does not extend any great distance south of the island, whilst the dry south wind comes from a much greater distance. The true dry south wind may blow strongly, but does not continue for many days, usually one or two, and at sunset dies away or is replaced by a west wind. Very occasionally it persists; especially was this so in December, 1892. Winds from the south-west are rarely felt in Las Palmas; owing to its position it is sheltered from this direction. If a south-west gale is blowing out at sea there may be an east wind, or the wind may blow from all points. These gales do not often occur on the eastern islands; they are more frequent on the westward.

A wind from the west continuing through the day is a very rare circumstance; I cannot find any record of it. In the evening it occurs, as it is the local land breeze that springs up at sunset.

*Number of observations of a wind from the west.*

| Means.     | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|--------|
| 9 a.m. . . | Nil  | Nil  | Nil  | Nil    | Nil  | Nil   | Nil   | Nil  | Nil   | Nil  | Nil  | Nil  | Nil    |
| Noon . . . | Nil  | Nil  | Nil  | Nil    | Nil  | Nil   | Nil   | Nil  | Nil   | Nil  | Nil  | Nil  | Nil    |
| 9 p.m. . . | 6·8  | 4·8  | 3·6  | 1·6    | ·4   | Nil   | ·3    | Nil  | 4·0   | 4·4  | 6·2  | 6·4  | 38     |

It is rare after a day of wind from the northern direction, but common after eastern or southern winds. As such it does not present any further characteristics of importance.

*No wind* of any description—a calm lasting through an entire day—is also an infrequent occurrence.

*Number of occasions with no wind.*

| Means.     | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|--------|
| 9 a.m. . . | 5·0  | 4·8  | 4·2  | 1·8    | 1·8  | ·6    | Nil   | Nil  | 1·6   | 1·4  | 3·2  | 4·4  | 29     |
| Noon . . . | 3·6  | 1·7  | ·2   | ·5     | 0    | ·3    | Nil   | Nil  | ·6    | 1·0  | 1·2  | 3·0  | 12     |
| 9 p.m. . . | 6·4  | 7·0  | 4·4  | 3·0    | 3·8  | ·6    | 2·3   | 2·0  | 1·6   | 5·2  | 4·2  | 5·4  | 46     |

At 9 a.m. a calm is more frequent than at noon, and again it is more noticed in the evening. Naturally it is much rarer during the summer months. The weather during these calm days is not very pleasant. If the sky is clear, the heat of the

sun is oppressive; but if cloudy, then the degree of humidity is high.

*The force of the wind.*—I estimated according to Beaufort's scale (0—12). This mode is somewhat rough, so that though it may be useful as an indication, the value of the statistical tables is open to doubt. I have, therefore, refrained from giving them. The northern set of winds rarely exceed 4, usually they are 1, 2, or 3; the eastern and southern 1—2, rarely 3 or 4.

The statistics of the *state of the sea* I also omit, as their value in this work is slight. Of much more importance is the *temperature of the sea*. This was observed several times each month, never in less than twenty feet of water, and at a depth of about two feet; the observations were taken at noon. The following are the mean temperatures:

*Temperatures of the sea. Monthly means.*

| Means of      | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.    |
|---------------|------|------|------|--------|------|-------|-------|------|-------|------|------|---------|
| Mean temp.    | 65·7 | 65·1 | 65·4 | 65·9   | 67·3 | 69·3  | 71·1  | 73·5 | 73·4  | 72·4 | 70·2 | 67·2°F. |
| Highest temp. | 66·4 | 65·6 | 66·2 | 66·6   | 68·3 | 70·8  | 72·5  | 74·0 | 73·8  | 73·1 | 71·5 | 68·9°F. |
| Lowest temp.  | 65·4 | 64·8 | 64·9 | 65·3   | 66·2 | 67·6  | 70·6  | 73·2 | 72·6  | 71·2 | 69·1 | 66·2°F. |

The highest temperature of the sea is in August; the lowest in February; during October, November, and December it falls rapidly; and rises as rapidly in May, June, and July. As far as I have observed, external influences have not much effect on the temperature. The currents are all from the north, and the prevailing winds assist the currents in making the sea run from north to south; the south wind does not blow continuously enough to affect the temperature or current to any appreciable extent. To show the effect of the sea temperature on the climate, the table of December, 1889 and 1890, is very instructive. During this month the mean temperature of the sea was 66·0° and 66·9° F.; the average mean for three years (1888, 1891, 1892) was 68·2° F.; the mean shade temperature during December, 1889 and 1890, was 62·7°, whilst for the three other years it was 65·2° F. Through the winter months there is not much difference between the shade temperature at noon and the sea temperature, though,



naturally, there is much more daily variation in the shade, as the temperature of the sea does not vary to any appreciable extent during the twenty-four hours. During the summer months there is a much greater difference between the two temperatures. The temperature of the sea round the various islands does not differ much. Thus at the end of November, 1892, whilst it was 68° F. in Las Palmas, at Fuerteventura, on November 27th and 30th, it was 68° F., and at Lanzarote, on November 28th and 29th, it was also 68° F. In March, 1893, whilst a little above 66·0° F. at Las Palmas, at Hierro, on February 28th, it was 66·0° F.; at Gomera, on March 1st, 66° F.; at Santa Cruz de la Palma, on March 2nd, it was 66·0° F.; and on March 3rd, at Santa Cruz de la Tenerife, it was also 66·0° F.

The thermometers for recording the maximum and minimum shade temperatures were placed in an ordinary Stevenson's

*Means of shade temperatures.*

|          | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.     |
|----------|------|------|------|--------|------|-------|-------|------|-------|------|------|----------|
| Maximum  | 66·8 | 68·1 | 68·3 | 69·2   | 71·1 | 73·6  | 76·1  | 79·2 | 77·7  | 76·0 | 72·1 | 68·8° F. |
| Minimum  | 57·8 | 57·9 | 58·9 | 60·0   | 62·9 | 66·1  | 68·8  | 70·2 | 68·4  | 66·8 | 63·2 | 59·7° F. |
| Range of | 9·0  | 10·2 | 9·4  | 9·2    | 8·2  | 7·5   | 7·2   | 9·0  | 9·3   | 9·1  | 8·7  | 9·1° F.  |
| Mean of  | 62·3 | 63·0 | 63·7 | 64·6   | 66·5 | 69·8  | 72·7  | 74·7 | 73·0  | 71·4 | 67·6 | 64·2° F. |

screen, with a north aspect. The main feature of the shade temperature is not only the small daily variation, but also the small variation in temperature between the coldest and warmest months.

Thus the difference between the coldest month, January, and the warmest month, August, in mean temperature is a little over 12°. Affected by the sea, the temperature falls rapidly in November and December, and rises rapidly in June and July. In detailing observations of this kind it is usual to give the maximum and minimum temperatures. As there may be rather wide differences in corresponding months, these observations are given in detail; very often they are nothing more than eccentricities, though a certain amount of uniformity exists.



|                                            | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.     |
|--------------------------------------------|------|------|------|--------|------|-------|-------|------|-------|------|------|----------|
| <i>Maximum shade temperature recorded.</i> |      |      |      |        |      |       |       |      |       |      |      |          |
| 1888                                       | —    | —    | —    | —      | —    | —     | —     | —    | —     | 85·5 | 75·5 | 73·5° F. |
| 1889                                       | 67·5 | 72·5 | 72·0 | 69·0   | 77·0 | —     | —     | —    | —     | 77·5 | 74·5 | 70·5° F. |
| 1890                                       | 71·0 | 74·5 | 72·0 | 71·5   | 80·0 | 81·5  | 76·0  | —    | 82·0  | 80·5 | 74·5 | 72·5° F. |
| 1891                                       | 71·0 | 71·0 | 75·0 | 82·0   | 80·0 | 77·5  | 83·0  | 85·5 | 81·0  | 81·5 | 79·5 | 76·0° F. |
| 1892                                       | 78·5 | 75·5 | 82·0 | 76·5   | 77·0 | 77·5  | 81·5  | 82·0 | 80·0  | 80·5 | 77·5 | 76·0° F. |
| 1893                                       | 73·5 | 73·5 | 81·5 | 74·0   | 78·0 | —     | —     | —    | —     | —    | —    | —        |
| <i>Minimum shade temperature recorded.</i> |      |      |      |        |      |       |       |      |       |      |      |          |
| 1888                                       | —    | —    | —    | —      | —    | —     | —     | —    | —     | 62·5 | 58·5 | 57·0° F. |
| 1889                                       | 55·0 | 54·5 | 56·5 | 53·5   | 58·0 | —     | —     | —    | —     | 58·0 | 61·5 | 52·5° F. |
| 1890                                       | 54·0 | 53·5 | 51·5 | 56·0   | 57·0 | 64·5  | 64·5  | —    | 65·5  | 65·0 | 58·0 | 53·5° F. |
| 1891                                       | 51·5 | 52·0 | 54·5 | 58·5   | 59·5 | 64·5  | 67·5  | 67·5 | 66·0  | 63·0 | 58·0 | 57·5° F. |
| 1892                                       | 56·5 | 57·0 | 55·0 | 56·0   | 56·5 | 61·0  | 67·5  | 68·5 | 65·0  | 63·5 | 59·5 | 55·0° F. |
| 1893                                       | 53·0 | 55·0 | 55·0 | 55·0   | 59·5 | —     | —     | —    | —     | —    | —    | —        |

The general effect of the winds on the temperature may have been gathered from what has been already stated. The more forcible the northern wind is, the mean temperature is lower, and the sky more cloudy. This is seen much more in the winter, especially when there is cold, perhaps snowy weather, in the south-west of Europe. This low mean temperature is not so much due to a low temperature during the night as to a low day temperature. In fact, on such days the temperature at night may be higher than the average. This may be seen from the examples given.

*Effect of Northern Wind on Temperature.*

|                             | Wind.      |        | Sunshine. |      | Temperature in shade. |                |                |
|-----------------------------|------------|--------|-----------|------|-----------------------|----------------|----------------|
|                             | Direction. | Force. | Hours.    | Min. | Max.                  | Min.           | Range.         |
| 1890. March 16              | N.         | 0-2    | 9         | 30   | Fahr.<br>72·0°        | Fahr.<br>60·5° | Fahr.<br>11·5° |
| " " 17                      | N.         | 1      | 7         | 0    | 68·0°                 | 61·5°          | 6·5°           |
| " " 18                      | N.-N.E.    | 2-3    | 4         | 40   | 64·0°                 | 58·5°          | 5·5°           |
| " " 19                      | N.-N.E.    | 2-3    | 3         | 20   | 65·5°                 | 59·0°          | 6·5°           |
| " " 20                      | N.         | 2-3    | 1         | 30   | 64·5°                 | 59·5°          | 5·0°           |
| " " 21                      | N.-N.E.    | 3      | 1         | 20   | 63·5°                 | 59·5°          | 4·0°           |
| " " 22                      | N.-N.E.    | 3      | 0         | 50   | 64·5°                 | 60·5°          | 4·0°           |
| " " 23                      | N.-N.E.    | 2-3    | 2         | 20   | 63·5°                 | 59·5°          | 4·0°           |
| " " 24                      | N.E.       | 1-2    | 3         | 10   | 65·5°                 | 61·0°          | 4·5°           |
| Average for month . . . . . |            |        |           |      | 64·7°                 | 57·6°          | 7·1°           |

With the south wind, on the contrary, the greater the force is, the temperature rises higher, and the range is greater, as, owing to radiation, it falls lower after sunset. This is well seen in the examples already given of the dry south wind, where the range of temperature for the seven days averages  $13^{\circ}$ . When this wind is moist in character this is not seen (see p. 13).

In recording the temperatures of the dry and wet bulb thermometers for the purpose of estimating the humidity, the readings of the dry bulb are those of the shade temperature at the hours of observation. The following are the means of the shade temperature taken at these hours :

|            | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.     |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|----------|
| 9 a.m. . . | 64·2 | 64·6 | 65·5 | 66·4   | 68·4 | 71·2  | 73·5  | 77·4 | 75·1  | 73·2 | 69·4 | 66·1° F. |
| Noon . .   | 65·9 | 66·7 | 67·2 | 67·5   | 69·8 | 72·2  | 74·4  | 79·0 | 76·2  | 74·6 | 70·8 | 67·8° F. |
| 3 p.m. . . | 65·2 | 65·3 | 65·5 | 66·9   | 68·4 | 71·1  | 74·2  | 76·6 | 75·2  | 73·5 | 69·8 | 66·0° F. |
| 9 p.m. . . | 60·6 | 60·7 | 62·0 | 63·0   | 65·1 | 68·4  | 70·8  | 73·2 | 70·7  | 69·6 | 66·1 | 62·9° F. |

From this table it may be seen that by 9 a.m. the temperature has risen  $5^{\circ}$ — $7^{\circ}$  above the minimum, and approximates by that time much more to the maximum ; by noon it has risen  $1^{\circ}$ — $2^{\circ}$  more, but the maximum is not reached till between 1 and 2 o'clock ; by 3 p.m. it has commenced to fall, though it is still higher than at 9 a.m. At sundown it falls rapidly to a minimum about an hour after sunset, then there is a slight rise of a degree or more. By 10 or 11 o'clock a fall again commences, and the absolute minimum temperature is reached in the early hours of the morning. The extent and conditions of the range of temperature have been alluded to. There is, however, this point to be noted, that a fall of a few degrees in a tropical or semi-tropical climate is often felt as much as a greater fall in a more temperate climate.

In order to gain an idea of the outside temperature, a thermometer was suspended so that it was under the influence of the sun when shining, and under any wind that might be blowing. These observations were recorded at the same time as the previous shade temperatures :

*Mean Temperature of Exposed Thermometer.*

| Means.     | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.     |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|----------|
| 9 a.m. . . | 71·2 | 72·7 | 73·4 | 72·0   | 73·6 | 76·6  | 80·2  | 86·7 | 85·1  | 81·7 | 75·2 | 73·5° F. |
| Noon . . . | 72·3 | 74·2 | 74·1 | 74·7   | 74·7 | 78·2  | 82·5  | 86·5 | 84·4  | 81·4 | 77·3 | 74·3° F. |
| 3 p.m. . . | 71·0 | 72·2 | 70·6 | 71·6   | 73·4 | 76·8  | 79·9  | 82·4 | 80·8  | 78·0 | 76·6 | 69·9° F. |
| 9 p.m. . . | 59·8 | 59·7 | 61·2 | 62·1   | 64·3 | 67·0  | 70·3  | 72·1 | 70·3  | 69·6 | 65·7 | 62·3° F. |

This I called the temperature in the sun and wind, but the value of these observations is, I admit, open to doubt; yet those of 9 p.m. may have more value than the others, as they show only a slight difference from the shade temperature at this hour, whilst those of the daytime do not show so great a difference as might have been expected: this is in a great measure due to the constant breezes keeping down the temperature, especially in summer.

From the readings of the dry and wet bulb the amount of humidity has been calculated by means of Glaisher's tables. There are many ways of expressing the amount; the one chosen is that representing the percentage by the cipher 100, equivalent to the atmosphere in a state of complete saturation. These observations I recorded at the same hours as the two previous ones; the following are the mean amounts:

*Humidity.*

|        | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |                              |
|--------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|------------------------------|
| 9 a.m. | 69   | 68   | 67   | 66     | 66   | 67    | 70    | 65   | 70    | 70   | 69   | 67   | Saturation<br>equals<br>100. |
| Noon   | 67   | 64   | 64   | 64     | 65   | 68    | 70    | 64   | 68    | 66   | 67   | 66   |                              |
| 3 p.m. | 66   | 64   | 68   | 65     | 65   | 68    | 71    | —    | 70    | 68   | 66   | 67   |                              |
| 9 p.m. | 74   | 76   | 74   | 74     | 74   | 74    | 76    | 74   | 78    | 77   | 74   | 77   |                              |

Naturally the degree of moisture is highest in the evening, though it is rare that saturation point is reached. Owing to the prevalence of some sort of breeze, there is not so much liability to the deposit of dew; the nights of greatest deposit are those which follow days of eastern or southern winds. Through the hotter months (the mean for August is one year



only) there is a slight increase in amount. This is not to be wondered at, as the higher the temperature is the more moisture the atmosphere can absorb; thus with the dry bulb at  $77^{\circ}$  F. each cubic foot of air requires 10·0 grains of moisture for saturation. If there is a difference of  $7^{\circ}$  F. between the dry and wet bulbs each cubic foot contains 6·7 grains of moisture, and requires 3·3 grains to complete the saturation. If, however, the dry bulb stands at  $64^{\circ}$  F. each cubic foot requires 6·6 grains for saturation, and if there is now a difference of  $7^{\circ}$  F. each cubic foot contains 4·2 grains of moisture and requires 2·4 grains to complete saturation. In addition to this increase of temperature it will be seen there is more cloudy though rainless weather during this period.

The effect of the eastern and southern winds on the humidity has been already alluded to; that of the northern can also be gathered from the tables. The stronger the force of this wind is the lower is the degree of humidity; even if there are showers of rain, they do not appear to have any permanent effect, as the soil being porous, the rainfall slight, and the wind dry, the excess of moisture is soon equalised. The details of the different forms of clouds are omitted. The most common are cirri, cirro-cumuli, and cumuli. These are the general forms of cloud noticed at sea in these latitudes, but the clouds floating below a certain level become entangled on the windward side of the islands, coalesce, and constitute one of the factors in forming the banks of cloud which often cover the mountain tops. This covering (parasol), dependent on the height and position of the mountains, varies in different localities, and will be again alluded to.

The rainfall was estimated by means of a 5-inch Howard's rain gauge. A glance at this table will show that the amount of rain and the number of days on which it fell are out of proportion :

*Rainfall.*

| Means.        | Jan.  | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct.  | Nov.  | Dec.  |       |
|---------------|-------|------|------|--------|------|-------|-------|------|-------|-------|-------|-------|-------|
| Amount        | 1·681 | ·576 | ·792 | ·404   | ·346 | ·036  | ·030  | Nil  | ·212  | 1·064 | 1·753 | 1·577 | inch. |
| No. of days } | 10    | 5·2  | 7·0  | 4·4    | 2·6  | 1     | ·3    | Nil  | 1·1   | 6·2   | 11·0  | 12·0  | days. |

This gives an average of 8·38 inches per annum, with an average of sixty-one days on which rain fell. It should be noted that the amount and number of days vary considerably in the same months of different years, thus :

|                   |              |         |                   |              |          |
|-------------------|--------------|---------|-------------------|--------------|----------|
| October, 1888 ... | ·05 in. ...  | 3 days. | January, 1889 ... | 1·87 in. ... | 20 days. |
| „ 1889 ...        | 1·46 in. ... | 13 „    | „ 1890 ...        | ·33 in. ...  | 4 „      |
| „ 1890 ...        | 3·00 in. ... | 6 „     | „ 1891 ...        | ·56 in. ...  | 6 „      |
| „ 1891 ...        | ·50 in. ...  | 5 „     | „ 1892 ...        | 2·20 in. ... | 11 „     |
| „ 1892 ...        | ·42 in. ...  | 4 „     | „ 1893 ...        | 3·43 in. ... | 9 „      |

Slight showers falling over a large number of days, or an unusually heavy rainfall lasting five or six hours, may make not only this monthly difference, but also a yearly difference of one or two inches above or below, since the yearly average of rainfall is not more than eight inches. This is well seen as follows :

|                                                                  |
|------------------------------------------------------------------|
| In 1889, with 84 days on which rain fell, the amount was 8·6 in. |
| In 1890 „ 66 „ „ „ 13·3 in.                                      |
| In 1891 „ 45 „ „ „ 5·3 in.                                       |
| In 1892 „ 52 „ „ „ 7·4 in.                                       |

Perhaps the best way to present the rainfall will be to divide the year into three periods, commencing with the month of October.

1. October to January averaged 6·075 in. that fell on 39·2 days.
2. February to May „ 2·030 in. „ 19·4 „
3. June to September „ 2·81 in. „ 3 „

The amount of rain in October is uncertain, depending on the commencement of the winter's rain. In those years when the rainfall in October has been heavy, that of November and December has also been heavy, but the rainfall of January has been exceptionally small ; this may be well seen from the following table :

| <i>October to December.</i> |           |       | <i>January.</i> |           |       | <i>Total (4 months).</i> |     |       |
|-----------------------------|-----------|-------|-----------------|-----------|-------|--------------------------|-----|-------|
|                             | Amount.   | Days. |                 | Amount.   | Days. | Amount.                  |     | Days. |
| 1888 ...                    | 2·735 in. | 18    | 1889 ...        | 1·875 in. | 20    | 4·610 in.                | ... | 38    |
| 1889 ...                    | 5·348 in. | 39    | 1890 ...        | ·330 in.  | 4     | 5·678 in.                | ... | 43    |
| 1890 ...                    | 7·895 in. | 34    | 1891 ...        | ·565 in.  | 6     | 8·460 in.                | ... | 40    |
| 1891 ...                    | 3·195 in. | 23    | 1892 ...        | 2·205 in. | 11    | 5·400 in.                | ... | 34    |
| 1892 ...                    | 2·800 in. | 22    | 1893 ...        | 3·430 in. | 9     | 6·230 in.                | ... | 31    |

The month of February shows a notable decrease both in amount and days; in March there is a slight increase, in April and May again there is a fall. During June and July, for three years, the total rainfall has been ·210 of an inch on four days. In August none has been registered during two years. During September the amount that fell in three years was ·06 inch on three days, but one heavy shower that measured ·577 inch has entirely overthrown the average of this month, which is usually similar to June and July. If the greatest amount of rain that fell in one day of each month is taken into consideration, a truer idea may be obtained of the relation between the amount of rain and the number of days on which rain was recorded. This is given in detail.

*Maximum Fall of Rain in Twenty-four Hours.*

|         | Jan.  | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct.  | Nov.  | Dec.       |
|---------|-------|------|------|--------|------|-------|-------|------|-------|-------|-------|------------|
| 1888    | —     | —    | —    | —      | —    | —     | —     | —    | —     | ·045  | ·305  | ·345 inch. |
| 1889    | ·435  | ·190 | ·060 | ·200   | ·080 | —     | —     | —    | —     | ·745  | ·630  | ·740 „     |
| 1890    | ·160  | ·360 | ·840 | ·030   | ·970 | Nil   | Nil   | Nil  | ·040  | 2·070 | 1·580 | ·290 „     |
| 1891    | ·200  | ·435 | ·090 | ·070   | ·070 | Nil   | ·100  | Nil  | ·010  | ·885  | ·700  | ·080 „     |
| 1892    | ·880  | ·240 | ·120 | ·600   | ·190 | ·060  | Nil   | Nil  | ·577  | ·225  | ·430  | ·255 „     |
| 1893    | 2·220 | ·130 | ·120 | ·150   | ·020 | —     | —     | —    | —     | —     | —     | —          |
| Average | ·974  | ·271 | ·235 | ·210   | ·266 | ·020  | ·033  | Nil  | ·209  | ·674  | ·729  | ·342 inch. |

If these figures are subtracted from those of the total average for each month as given on p. 21, it will be seen that on eleven days of each year the average rainfall measures four inches, thus leaving the other four inches (4·38) to fall on the remaining fifty days; this is spread over the year as follows :



*Rainfall minus one day.*

|        | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov.  | Dec.        |
|--------|------|------|------|--------|------|-------|-------|------|-------|------|-------|-------------|
| Amount | ·707 | ·305 | ·557 | ·194   | ·080 | ·016  | —     | —    | ·003  | ·390 | 1·022 | 1·253 inch. |
| Days   | 9    | 4·2  | 6    | 3·4    | 1·6  | ·3    | —     | —    | ·3    | 5·2  | 10    | 11          |

In the preceding the days signify twenty-four hours, but if split up into daytime and night-time, which for convenience is reckoned by 9 a.m. and 9 p.m., it will be found that more rain falls during the night than through the day. This may be seen from the following :

|                                 | Average rainfall. |              |
|---------------------------------|-------------------|--------------|
|                                 | Daytime.          | Night-time.  |
| October to January (five years) | 2·51 inches       | 3·56 inches. |
| February to May (five years)    | ·79 inch          | 1·33 inch.   |
| June to September (three years) | ·016 „            | ·266 „       |

Rain also falls more frequently during the night-time than daytime.

*No. of occasions rain fell—average amount.*

|            | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|
| Daytime    | 6·6  | 2·8  | 3·2  | 2·0    | ·6   | ·3    | Nil   | Nil  | ·6    | 4·0  | 5·2  | 7·4  |
| Night-time | 7·2  | 4·4  | 6·4  | 3·8    | 2·2  | ·6    | ·3    | Nil  | ·6    | 5·2  | 9·0  | 8·2  |

This may, perhaps, be more easily seen from the following table :

|                    | Number of days observed. | Rain was recorded as falling during the |                |
|--------------------|--------------------------|-----------------------------------------|----------------|
|                    |                          | Daytime.                                | Night-time.    |
| October to January | 615                      | On 112 occasions                        | 146 occasions. |
| February to May    | 611                      | „ 43 „                                  | 84 „           |
| June to September  | 366                      | „ 3 „                                   | 6 „            |

The rainfall of the group varies considerably, the difference being due to the proximity of the African continent, and in a minor degree to local causes. In Las Palmas the local influences are little felt, as the town is situated on the north-east point of the island, at some distance from the mountain ranges, and is midway between the African coast and the

most western islands. The rainfall, therefore, may be taken as typical of this region.

On page 11 there is an example of weather that shows the character of this rain. It falls in short sharp showers, and the weather before and after is fine. These showers may be very local in character, and can often be seen approaching Las Palmas, or passing at some little distance to seaward; they are usually preceded for a few minutes by a temporary increase in the force of the wind. I have also noticed that they are contemporaneous with stormy, unsettled weather over the south-west part of Europe.

Las Palmas is sheltered from the south-west quarter, but when there are gales from this direction prevailing in the vicinity, the wind may be very changeable, blowing from all points of the compass, or else a local east wind may be recorded. The rain associated with the wind from this direction is semi-tropical in character, and is often accompanied with electrical phenomena. This is seen from the following:

|       |           |      | Wind.        | Clouds.       | Sunshine. |    | Rainfall. |
|-------|-----------|------|--------------|---------------|-----------|----|-----------|
|       |           |      |              |               | H.        | M. |           |
| 1890. | March     | 4th  | E.           | { Stratus     | 0         | 0  | ·305 in.  |
| "     | "         | 5th  | E.-N.E.-N.W. | { and nimbi } | 0         | 0  | ·840 in.  |
| 1892. | September | 20th | N.E.-W.      | Strati        | 2         | 30 | ·577 in.  |
| "     | December  | 5th  | Nil-S.E.     | Cirri         | 6         | 50 | ·210 in.  |
| "     | "         | 6th  | S.E.-W.      | Cirro-strati  | 0         | 0  | ·240 in.  |
| 1893. | January   | 6th  | Nil-S.E.     | Nimbi         | 0         | 0  | ·232 in.  |
| "     | "         | 7th  | S.-S.W.-W.   | Strati        | 1         | 40 | ·340 in.  |

On all these days the clouds were recorded as moving from the south-west, and on the last five days there was recorded thunder and lightning.

These south-western gales are oftener experienced in the western than in the eastern islands.

The rainfall due to local insular causes is in proportion to the extent and density of the "parasol" of clouds, and therefore there may be considerable variation in different districts.

*Sunshine.*—On page 11 may be seen a table that shows how little influence the rainfall associated with the northern set of winds has on the amount of sunshine. This is not remarkable considering that four inches, or half the amount

of rainfall, is spread over fifty days, and the greater part of this falls during the night. The sunshine was recorded by means of a Jordan's photographic sunshine recorder, and the averages are as follows :

*Sunshine—hours.*

|                                                                              | Jan.           | Feb.           | Mar.          | April.         | May.           | June.          | July.          | Aug.          | Sept.          | Oct.             | Nov.           | Dec.           |
|------------------------------------------------------------------------------|----------------|----------------|---------------|----------------|----------------|----------------|----------------|---------------|----------------|------------------|----------------|----------------|
| Total possible amount }                                                      | 326            | 314            | 372           | 382½           | 419            | 418            | 426            | 406½          | 370            | 353½             | 324½           | 318            |
| Amount recorded {                                                            | 1888           | —              | —             | —              | —              | —              | —              | —             | —              | 122 <sup>1</sup> | 166            | 129            |
|                                                                              | 1889           | 137            | 167           | 193            | 140            | 212            | —              | —             | —              | 124 <sup>2</sup> | 186            | 137            |
|                                                                              | 1890           | 203            | 161           | 135            | 186            | 195            | 172            | 108           | —              | 196              | 164            | 165            |
|                                                                              | 1891           | 152            | 210           | 237            | 220            | 203            | 238            | 227           | 214            | 202              | 167            | 146            |
|                                                                              | 1892           | 171            | 186           | 172            | 197            | 256            | 171            | 208           | 165            | 214              | 200            | 154            |
|                                                                              | 1893           | 178            | 194           | 206            | 209            | 223            | —              | —             | —              | —                | —              | —              |
| Average . . .                                                                | 168            | 183            | 189           | 190            | 218            | 194            | 181            | 190           | 204            | 155              | 163            | 161            |
| <i>Average daily amount per month.</i>                                       |                |                |               |                |                |                |                |               |                |                  |                |                |
| Total . . .                                                                  | H. M.<br>10 31 | H. M.<br>11 18 | H. M.<br>12 0 | H. M.<br>12 45 | H. M.<br>13 37 | H. M.<br>13 56 | H. M.<br>13 42 | H. M.<br>13 7 | H. M.<br>12 22 | H. M.<br>11 24   | H. M.<br>10 45 | H. M.<br>10 23 |
| Recorded . . .                                                               | .5 26          | 6 31           | 6 5           | 6 22           | 7 2            | 6 24           | 5 59           | 6 8           | 6 49           | 6 12             | 5 23           | 5 12           |
| Highest . . .                                                                | .6 34          | 7 38           | 7 40          | 7 21           | 8 15           | 7 36           | 7 20           | 6 35          | 7 0            | 6 27             | 6 10           | 6 0            |
| Lowest . . .                                                                 | .4 26          | 5 40           | 4 22          | 4 40           | 6 18           | 5 42           | 3 30           | 5 21          | 6 32           | 5 18             | 4 53           | 4 9            |
| Average per-<br>centage of<br>available<br>amount (100=<br>total possible) } | 51·9           | 57·7           | 51·6          | 49·9           | 51·9           | 45·9           | 42·4           | 45·7          | 54·3           | 53·6             | 52·2           | 50·5           |

Although there is more actual sunshine recorded during the summer than the winter, owing to the sun being longer above the horizon, yet during the former period there is actually a smaller percentage recorded, and there is more cloudy weather. This may, perhaps, be better understood if the year is divided into the same three periods as for rainfall.

<sup>1</sup> and <sup>2</sup>. Recorded for 14 and 24 days respectively.

|                                       | Total amount possible. | Average amount recorded. | Average daily amount. |         | Average percentage of possible amount. |
|---------------------------------------|------------------------|--------------------------|-----------------------|---------|----------------------------------------|
| 1. October to January                 | 1317 hours             | 683. hours               | Hrs. 5                | Min. 32 | 52.05 %                                |
| 2. February to May                    | 1487 „                 | 780 „                    | 6                     | 30      | 52.10 %                                |
| 3. June to September                  | 1620 „                 | 749 „                    | 6                     | 8       | 47.10 %                                |
| (June to August, excluding September) | —                      | —                        | —                     | —       | 44.5 %                                 |

—the total annual amount of sunshine possible in Las Palmas is about 4425 hours, and of this 2212 hours of bright sunshine are the annual average amount recorded. The period of increased cloudiness corresponds to the period of greatest continuity of the northern winds, and unsettled weather over the Atlantic Ocean off the south-west of Europe. In Las Palmas this increase of cloudiness, due in a great measure to extended formation of clouds round the mountain tops spreading beyond the limits of the island, has the great advantage of breaking the direct rays of the sun at the hottest period of the year, though at the same time slightly increasing the humidity.

All the year round the major part of the obscuration of the sun is due to this formation of local cloud. From this it may be gathered that there is more sunshine recorded during the morning than afternoon. Even in the winter the sun when sinking into the west goes behind the parasol of clouds, whilst overhead in Las Palmas it may be perfectly clear.

There are days of total cloudiness, but these are not numerous, as may be seen from the following table, which gives the average number of days with less than one hour's sunshine :

*Days with less than one hour's sunshine.*

|       | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.      |
|-------|------|------|------|--------|------|-------|-------|------|-------|------|------|-----------|
| Means | 2.6  | 2.0  | 2.8  | 1.4    | 2.6  | 2.3   | 4.0   | 3.0  | 1.3   | 1.6  | 2.0  | 2.2 days. |

—making a total of twenty-eight during the year.

The difference in the time between sunrise and sunset



during the summer and winter months is not more than two and a half hours. After sunset there is little or no twilight, darkness coming on within half an hour.

As mentioned, there is not much correspondence between rainfall and sunshine, though there is, to a certain extent, between the sunshine and the shade temperature of the day-time; that of the night-time has more connection with the temperature of the sea. The following table for January makes this more apparent :

|      | Sunshine. | Rainfall. |       | Mean of shade temperature. |       |        | Mean temperature of the sea. |
|------|-----------|-----------|-------|----------------------------|-------|--------|------------------------------|
|      |           | Amount.   | Days. | 9 a.m.                     | Noon. | 9 p.m. |                              |
| 1889 | 137 hours | 2·075 in. | 20    | 62·9°                      | 64·7° | 61·3°  | 66·7°                        |
| 1890 | 203 „     | ·330 in.  | 4     | 64·0°                      | 66·1° | 60·1°  | 64·1°                        |
| 1891 | 152 „     | ·565 in.  | 6     | 63·0°                      | 63·8° | 58·9°  | 64·2°                        |
| 1892 | 171 „     | 2·205 in. | 11    | 65·2°                      | 67·6° | 61·5°  | 66·6°                        |
| 1893 | 178 „     | 3·430 in. | 9     | 66·0°                      | 67·4° | 61·2°  | 66·9°                        |

The barometric pressure does not vary much ; this can be well understood considering the continuity of the winds and the absence of storms. For days together there may be no variation ; thus at noon on April 12th, 13th, 14th, 15th, and 16th, 1893, the barometer stood at 30·20 : this constancy is seen over and over again. The two main factors in barometric change are the northern and southern set of winds.

This can be seen from the following table. I have taken the average of nine days in the month of January on which a south or east wind blew, and also given other days in the same month with the wind from the northern direction.

| Southern winds. |                |                |     | Northern winds. |     |            |  |
|-----------------|----------------|----------------|-----|-----------------|-----|------------|--|
| 9 a.m.          |                | 9 p.m.         |     | 9 a.m.          |     | 9 p.m.     |  |
| January, 1891   | ... 29·994 in. | ... 29·982 in. | ... | 30·176 in.      | ... | 30·162 in. |  |
| January, 1893   | ... 30·010 in. | ... 29·994 in. | ... | 30·235 in.      | ... | 30·236 in. |  |

The high barometric pressure is continued during the summer months, when the wind is more continuous from the north. Very often the advent of the south wind can be detected by the barometer falling below 30·00, but the advent of strong, boisterous northern winds with squalls of



rain by the barometer rising above 30·20. The barometer has fallen on those rare occasions when there have been gales from the south-west in the vicinity of the island.

Up to September, 1892, I had seen only two or three thunderstorms. But in September and December of that year, and January, 1893, three or four storms came up from the south-west, accompanied by heavy falls of rain. During the one in January, 1893, there was a regular hailstorm, with stones the size of marbles.

With these thunderstorms there is often a considerable fall in temperature for some time previously: thus in September, 1892, the mean minimum temperature was 69·3° F., and the night before the thunderstorm it fell to 65·0° F.; in January, 1893, the mean shade temperature through the daytime for the first ten days was nearly 68·5° F., but on the 6th the temperature did not rise higher than 64·0° F.

Occasionally sheet lightning may be seen playing on the horizon, but otherwise electrical phenomena are decidedly few.

## SECTION IV.

### LOCALITIES SUITABLE FOR HEALTH RESORTS, AND THEIR DISTINCTIVE CHARACTERISTICS.

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LA PALMA.—SANTA CRUZ.

TENERIFFE.—SANTA CRUZ. GUIMAR. PUERTO and VILLA ORATAVA.

ICOD. LAGUNA. VILA FLOR.

GRAND CANARY.—LAS PALMAS. TELDE. EL MONTE. GUIA.

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THE localities suitable for health resorts are governed by three conditions :

1. Accessibility by land or sea.
2. Accommodation.
3. Altitude.

*Accessibility.*—Las Palmas in Grand Canary, and Santa Cruz de Tenerife, are now recognised ports of call for steamers going to all parts of the world, sailing from various ports of the United Kingdom, Germany, Spain, and Italy. At the present time nearly 250 steamers call every month.

*Accommodation.*—This varies, the prices ranging from four shillings a day in some of the Spanish fondas to fifteen shillings in some modern hotels. Accommodation can be obtained at various altitudes with various aspects, and will be alluded to more in detail.

*The altitude.*—According to the altitude and distance from the sea the temperature is lower, there is more rain and less sunshine ; this is more marked on the northern than the eastern and southern slopes of the mountains. Abrupt mountain ranges, like those of Teneriffe or La Palma, do not possess so many localities suitable for health resorts as do the more gradual sloping islands of Grand Canary, Lanzarote, and Fuerteventura. In addition to these differences there are some others that in these latitudes make a great difference between

the air at sea level and the air even a little distance inland. It may be due to the quantity of ozone present. From some observations made at Oratava by Professor Rothpletz the air at sea level was found to be excessively rich in ozone. This may go *pari passu* with the amount of spray from sea surf which is being constantly blown inland, particularly on the northern coasts; this, I know, has a distinct effect in certain cases of illness.

In considering the individual islands, those of Hierro, Gomera, Lanzarote, and Fuerteventura can be easily dismissed. They all have communication once a week with the islands of Teneriffe and Grand Canary by means of steamers belonging to the Interinsular Company. In the first two islands there is no accommodation, and in the latter two there are small Spanish fondas in the principal towns of Arecife and Puerto Cabras. There are no meteorological data of these islands. As to the capabilities in Hierro and Gomera, the climate is not so good as on the north side of Teneriffe, so that nothing can be gained by residing there.

With regard to Lanzarote and Fuerteventura, they, no doubt, possess the driest and sunniest climate of the group, and if there were accommodation advantage might be taken of them, particularly in the interior, but at present they are outside the pale of health resorts.

The island of La Palma has also communication once a week with Teneriffe and Grand Canary, and once a month with London.

The mountain ranges run due north and south, and although the island is only thirty-two miles long by nineteen broad, yet the mountain tops reach over 7000 feet in height. The effect of this is that the mountains collect and form clouds which roll along the sides of the slopes.

The chief town of La Palma, Santa Cruz de la Palma, is most picturesque in its surroundings, the mountains rising abruptly, covered with vegetation, and in the upper part with pines (*Pinus canariensis*), laurels, and heather that here grows into a good-sized tree. In the town there are two Spanish fondas, and another hotel that hitherto has been under English management.

There is one carriage road (*carretera*) that runs from the town towards the south of the island, and is still under construction. In the west of this island there is a natural mineral spring that will be alluded to later.

The following meteorological observations were observed by El Señor Don Sebastian C. Arozena. The temperature is the mean for six years, and the humidity and rainfall are for one year.<sup>1</sup>

*Santa Cruz de la Palma.*

| Means of             | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec.     |
|----------------------|------|------|------|------|------|------|-------|------|-------|------|------|----------|
| Shade temperature    | 59·4 | 60·4 | 63·7 | 64·9 | 68·4 | —    | —     | —    | —     | 70·2 | 65·8 | 61·2°F.  |
| Range of shade temp. | 12·6 | 14·9 | 14·2 | 15·5 | 15·0 | —    | —     | —    | —     | 11·5 | 12·8 | 14·2°F.  |
| Humidity, Sat.=100.  | 78   | 76   | 76   | 73   | —    | —    | —     | —    | —     | 78   | 74   | 73       |
| Amount of rain .     | 5·98 | 5·2  | 1·29 | ·84  | —    | —    | —     | —    | —     | 6·43 | 2·36 | 3·39 in. |
| Number of days       | 17   | 13   | 7    | 6    | —    | —    | —     | —    | —     | 16   | 16   | 19       |

The rainfall is for 1892—1893, and in the following table I have compared it with that of Las Palmas for the same period.

| 1892.                    |          |          |          | 1893.    |         |          |         | Total.    |
|--------------------------|----------|----------|----------|----------|---------|----------|---------|-----------|
| Oct.                     | Nov.     | Dec.     |          | Jan.     | Feb.    | Mar.     | Apr.    |           |
| Las Palmas ...           | ·42 ...  | 1·07 ... | 1·30 ... | 3·43 ... | ·15 ... | ·57 ...  | ·39 ... | 7·33 in.  |
| Santa Cruz de la Palma } | 6·43 ... | 2·36 ... | 3·39 ... | 5·98 ... | ·52 ... | 1·29 ... | ·84 ... | 20·81 in. |

*Number of Days on which Rain fell.*

| 1892.                    |        |        |        | 1893.  |        |        |       | Total.   |
|--------------------------|--------|--------|--------|--------|--------|--------|-------|----------|
| Oct.                     | Nov.   | Dec.   |        | Jan.   | Feb.   | Mar.   | Apr.  |          |
| Las Palmas ...           | 4 ...  | 9 ...  | 9 ...  | 9 ...  | 2 ...  | 10 ... | 5 ... | 48 days. |
| Santa Cruz de la Palma } | 16 ... | 16 ... | 19 ... | 17 ... | 13 ... | 7 ...  | 6 ... | 94 days. |

The island of Tenerife, sixty miles long and fifty-seven at its broadest part, has as its main feature a backbone of mountains running from the north-east to south-west points of the compass. In the northern part this is 3000 feet above sea level; and in the southern part it rises to form the Peak of Tenerife, 12,180 feet high. The slopes of this ridge fall

<sup>1</sup> For these observations on La Palma, and also for La Laguna and Vila Flor, I am indebted to Mr. Samler Brown, who has collected them for the new edition of his 'Madeira and the Canary Islands.'



somewhat abruptly to sea level, and the climate of the two slopes vary considerably.

*The northern slope.*—The prevailing winds are from the northern direction, blow against the side of the range, and are deflected upwards. As the air ascends it becomes colder, and is unable to contain as much moisture as at sea level, the excess of saturation is deposited in the form of clouds which cling to the side of the mountain.



*The eastern slope.*—Unless the winds are well round to the north-east they are not much felt, though in the northern part, where the mountains are not so high, the force may be only slightly mitigated. In the southern part, where the mountain ranges are much higher, a wind from the east is more frequently felt than in other parts, and is probably a local wind due to the deflection upwards of the wind on the other side of the island. Though participating in the weather general to this region this eastern slope is drier and sunnier, and the temperature higher than the northern side. Occasionally the clouds from the north side may pour over the ridge (cordillera) of the mountain range in a very similar manner to the way in which the clouds pour over Table Mountain near Cape Town, where on a smaller scale very analogous circumstances occur. Usually the cloud is con-

fined to the northern slope. It is very interesting to stand on the summit of the cordillera, 7000 feet above sea level ; on the one side you look upon a sea of cloud extending along the mountain range and out to sea for a mile or more, whilst overhead and on the other side (east) of the ridge there is bright sunny weather. Any of this cloud attempting to pass a certain definite invisible boundary is instantly absorbed.

*Santa Cruz de Tenerife*, the capital and port of the island of Teneriffe, is situated on the eastern coast, fourteen miles from the most northern point of the island. It is sheltered from the west, north-west, and north by mountain ranges 3000 feet high. The country around is dry and barren, partly because of its rocky nature, but also on account of the scarcity of water for irrigation. The climate resembles that of Las Palmas, only it is more sheltered from the prevailing winds ; the temperature is somewhat higher, especially in summer, and apparently more rainfall. The following are the meteorological observations for five years :

*Santa Cruz de Tenerife.*

|                       | Jan.     | Feb.  | Mar.  | April. | May. | June | July. | Aug. | Sept. | Oct.  | Nov.  | Dec.               |          |
|-----------------------|----------|-------|-------|--------|------|------|-------|------|-------|-------|-------|--------------------|----------|
| Shade temp.           | { Max. . | 69·0  | 68·0  | 69·8   | 70·2 | 75·5 | 79·0  | 83·5 | 83·5  | 81·1  | 78·4  | 74·2               | 71·0° F. |
|                       | { Min. . | 59·0  | 56·5  | 59·2   | 60·2 | 64·2 | 65·0  | 67·5 | 67·5  | 68·4  | 64·6  | 60·6               | 56·6° F. |
|                       | { Range. | 10·0  | 11·5  | 10·6   | 10·0 | 11·3 | 14·0  | 16·0 | 16·0  | 12·7  | 13·8  | 13·6               | 14·4° F. |
|                       | { Mean . | 63·5  | 62·8  | 64·8   | 65·2 | 69·0 | 73·0  | 76·2 | 76·2  | 74·7  | 73·0  | 68·8               | 65·5° F. |
| Rainfall              | ·2314    | 1·860 | 1·690 | 1·131  | ·404 | —    | —     | —    | ·102  | 1·273 | 1·984 | 2·244 in.          |          |
| Humidity <sup>1</sup> | 66·5     | 66    | 63    | 57     | 58   | 66   | 56    | 55   | 62    | 65    | 66    | 67 { Sat.<br>= 100 |          |

The only other locality accessible on the eastern slope is *Guimar*, twenty miles to the south of Santa Cruz and connected by a good carriage road. It is even more sheltered than Santa Cruz ; the mountains behind rise to the height of 7000 feet. The village stands at a height of 1000 feet above, and three miles from the sea. The surrounding country—in fact, the whole country from Santa Cruz—is rugged and barren, producing chiefly a cereal crop in the winter months.

<sup>1</sup> Observed 9 a.m. and 3 p.m.

The temperature of Guimar is lower than Santa Cruz, and is more sheltered from the winds, and there are claimed for it more sunshine and less rain than any other place. The meteorological data are very meagre, and some of the figures are doubtful.

*Guimar.*

| Means.     | Shade temperature. |             |             |             | Rainfall.    |       | Humidity. |        | Shade temp. Las Palmas. |             |
|------------|--------------------|-------------|-------------|-------------|--------------|-------|-----------|--------|-------------------------|-------------|
|            | Max.               | Min.        | Range.      | Mean.       | Amount.      | Days. | 9 a.m.    | 9 p.m. | Max.                    | Min.        |
| 1889. Dec. | Fahr. 65·0°        | Fahr. 52·3° | Fahr. 12·7° | Fahr. 57·6° | Inches 1·633 | 2     | 64·8      | 64·1   | Fahr. 66·8°             | Fahr. 58·6° |
| 1890. Jan. | 63·5°              | 52·0°       | 11·5°       | 57·8°       | ·009         | 0     | 60·3      | 58·7   | 67·0°                   | 57·5°       |
| „ Feb.     | 66·7°              | 53·1°       | 13·6°       | 59·9°       | ·025         | 1     | 58·7      | 61·9   | 66·9°                   | 57·8°       |
| „ Mar.     | 64·9°              | 50·0°       | 14·9°       | 57·4°       | 2·266        | 10    | 61·4      | 62·7   | 64·7°                   | 57·6°       |

The rainfall in Las Palmas during these months was 2·543, ·330, ·630, 2·870 inches.

The hotel is small, only accommodating some eight or ten persons, as there is nothing to do and absolutely nothing to see; full advantage has not, perhaps, been taken of this place as a health resort.

Separated from the valley of Guimar by a mountainous range 7000 feet high, the valley of Oratava looks towards the north and north-west; in this valley are comprised the most noted health resorts of the group. This valley is like a huge amphitheatre, or depression in the mountain side, and is open to the sea on the north. The lateral walls, constituting the east and west sides, are formed of mountain ranges from 4000 to 7000 feet high, the southern or posterior wall rising more or less gradually from the sea level to the cordillera, here ranging from 7000 to 8000 feet. It is on this posterior wall up to the height of 1200 feet that accommodation of various kinds may be obtained. The greater part of the low-lying lands are under cultivation; the limit of cultivation is a little over 3000 feet, above which the ground is more or less covered with scrub, bushes, and trees to the height of 6000 or 7000 feet; above this trees are represented only by the *Pinus canariensis* and the Retama, a species of broom. The predominant feature of this part of the island



is the parasol of clouds. Dr. Perez, writing in the 'British Medical Journal,' October 1st, 1892, states that "the north-east winds begin to blow some hours after sunset; . . . when they begin to be perceived small clouds form in the mountains, which coalesce about 11 a.m. The upper parts of the island (?) are generally covered by a parasol of clouds;" this usually lightens off at sunset. This cloud varies in height; it is from 3000 to 4000 feet thick; its under surface may extend as low as 2500 to 3000 feet above sea level, and its upper edge reaches to the cordillera. Naturally it varies in density and height, and according as these conditions vary, so it more or less affects the direct rays of the sun and the temperature, but its greatest effect is on the humidity. Being dependent on the northerly winds, it is more continuous during the summer months. On days of strong wind it is denser than when there is little wind; it may be altogether absent,—with a south wind it usually is absent. Another feature of this part of the island is that the sea is rarely moderate, usually there is either a ground swell or it is rough; the surf is carried inland by the prevailing winds in the form of a minute spray.

The two towns in the valley where accommodation is provided are the Puerto Oratava and the Villa Oratava. *El Puerto Oratava* is on the sea-coast, and in and around this town are the majority of the hotels and villas where accommodation can be obtained at different degrees of elevation. The immediate surroundings are volcanic, lava and cinders being predominant. Further inland cultivation is carried on, and with the background of the mountains covered to a great height with verdure makes a most picturesque scene, especially early in the morning and late in the afternoon when the peak rears its lofty head against the blue heavens.

The climate of Oratava has already been alluded to, but observations on its meteorology are not very extensive or continuous.



*Oratava.*

| Means.             | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec., 1890-1892. |
|--------------------|------|------|------|------|------|------|-------|------|-------|------|------|------------------|
| Shade temp. {      |      |      |      |      |      |      |       |      |       |      |      |                  |
| Max.               | 65.8 | 66.4 | 69.8 | 70.6 | 72.3 | 76.2 | 79.0  | 79.0 | 78.9  | 76.5 | 70.5 | 67.3° F.         |
| Min.               | 53.1 | 54.5 | 54.6 | 57.2 | 58.2 | 61.9 | 65.6  | 66.4 | 65.1  | 63.5 | 58.2 | 55.1° F.         |
| Range              | 12.7 | 11.9 | 15.2 | 13.4 | 14.1 | 14.3 | 13.5  | 12.5 | 13.8  | 13.2 | 12.3 | 12.2° F.         |
| Mean               | 59.4 | 60.4 | 62.5 | 63.8 | 65.7 | 69.0 | 72.3  | 72.6 | 72.0  | 69.9 | 64.3 | 61.2° F.         |
| Rainfall           | 2.13 | 1.38 | 60   | 1.16 | 1.14 | .05  | Nil   | Nil  | .004  | 1.39 | 3.31 | 2.87 inches.     |
| Humidity, 9 a.m. } | 73   | 70   | 69   | 69   | 69   | 71   | 70    | 74   | 76    | 75   | 78   | 77. Sat. = 100.  |
| Sunshine           | 5.26 | 5.57 | 6.18 | 4.48 | 6.23 | 6.14 | 5.44  | 5.57 | 5.16  | 5.16 | 4.32 | 4.2 hrs. min.    |

These observations were made by Mr. Perry, of Sitio de Cullin. I am doubtful whether the sunshine is recorded or estimated. They differ somewhat from those observed by Mr. Borham at a level of 346 feet.

|              | Jan.  | Feb.  | Mar.  | Apr.                                               | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec., 1888-1889. |
|--------------|-------|-------|-------|----------------------------------------------------|------|------|-------|------|-------|------|------|------------------|
| Mean temp.   | 57.8  | 58.4  | 59.3  | —                                                  | —    | —    | —     | —    | —     | —    | 64.5 | 60.5° F.         |
| Humidity     | 76    | 74    | 77    | { 3 observations daily<br>(9 a.m., 3 and 9 p.m.) } |      |      |       |      |       |      | 75   | 84 { Sat. = 100. |
| Sunshine     | 3.27  | 5.16  | 4.48  | —                                                  | —    | —    | —     | —    | —     | —    | 3.48 | 3.13 hrs. min.   |
| Rainfall     | 2.203 | 1.430 | 1.174 | —                                                  | —    | —    | —     | —    | —     | —    | 5.13 | 3.99 inches.     |
| Days of rain | 14    | 10    | 8     | —                                                  | —    | —    | —     | —    | —     | —    | 8    | 17               |

Honnegger's observations, as given by Mr. Ernest Hart in his "Winter Trip to the Fortunate Islands," which originally appeared in the 'British Medical Journal,' 1887, vol. i, are more complete with regard to rainfall, but less so with the other observations. As they are often quoted, they are given in detail.

| Means.      | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Years. |
|-------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|--------|
| Mean temp.  | 58.8 | 60.0 | 61.0 | 63.7   | 68.3 | 70.8  | 72.8  | 74.6 | 74.0  | 68.9 | 66.5 | 61.7 | ?      |
| " "         | 62.0 | 62.6 | 63.7 | 66.5   | 69.7 | 72.5  | 75.3  | 77.0 | 74.5  | 71.9 | 69.2 | 65.3 | ?      |
| Rainfall    | 1.96 | 2.50 | 2.08 | .745   | .43  | .002  | Nil   | .03  | .07   | 1.37 | 1.72 | 2.12 | 10     |
| No. of days | 6.5  | 6.3  | 8.4  | 5.0    | 3.0  | .6    | .4    | .2   | 1.4   | 5.7  | 7.1  | 7.2  | 10     |

The number of years of observations for temperature are not given, but both sets are supposed to have been taken at a level of 300 feet,—much the same altitude as those taken by Mr. Borham. I should be rather inclined to think that those of the second row were taken at a lower level. The rainfall is estimated from 1874 to 1884, and is given as follows, reckoning from August to July :

|            | 1874-75 | 75-76 | 76-77 | 77-78 | 78-79 | 79-80 | 80-81 | 81-82 | 82-83 | 83-84 | 84-85     |
|------------|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----------|
| Amount . . | 14·04   | 16·60 | 7·86  | —     | 5·08  | 14·72 | 7·56  | 13·16 | 9·23  | 23·58 | 17·19 in. |
| Days . . . | 56      | 50    | 41    | —     | 23    | 50    | 46    | 45    | 47    | 83    | 78        |

With regard to the winds the valley is open to the west, north-west, north, and north-east, but sheltered from the east and south. From what I have seen the northern winds die down somewhat towards evening, being replaced by a land breeze which here is from the south. The force of the wind is not perhaps felt so much, as the lower part of the valley is sheltered by the mountains which rise abruptly in the rear. But on this subject there does not appear to be enough of detail from which to judge.

*The Villa Oratava*, 1300 feet above sea level, is four miles from the sea, and being nearer to the “parasol,” is more under its influence. The temperature is lower and the humidity is greater, the sunshine is less and the rainfall is greater, both in amount and number of days, than in Oratava. In this village there is an hotel conducted on English principles, as well as two Spanish hotels.

The only other village on the northern slope of Teneriffe where there is accommodation is at *Icod de los Vinos*, commonly called Icod. It is sixteen miles to the west of the Puerto Oratava, 1000 feet above sea level, and is on the direct slope of the Peak, which is here visible from head to foot. It is to a great extent free from the influence of the parasol. The climate is better than at the Villa Oratava or Laguna. Its great drawback is, that excepting the carriage road leading to Oratava, all the others are bridle-paths, very

steep and paved with small cobble-stones, that make walking very difficult. Nothing is known of its meteorology.

The following are the meteorological observations at the Instituto in Laguna for four years 1884—1888.

*Laguna.*

|                        | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec.    |
|------------------------|------|------|------|------|------|------|-------|------|-------|------|------|---------|
| Shade { Mean .         | 54.1 | 54.3 | 56.9 | 57.2 | 63.9 | —    | —     | 71.5 | —     | 65.4 | 59.7 | 56.2°F. |
| temp. { Minimum .      | 46.8 | 45.7 | 47.5 | 49.4 | 52.8 | —    | —     | 60.4 | —     | 56.9 | 52.7 | 48.4°F. |
| { Range of .           | 14.6 | 17.3 | 18.8 | 15.6 | 19.3 | —    | —     | 22.2 | —     | 16.9 | 14.9 | 15.6°F. |
| Humidity, Sat.=100.    | 82.8 | 79.7 | 77.3 | 79.7 | 73.9 | —    | —     | 64.3 | —     | 80.4 | 83.2 | 82.9    |
| Rainfall, amount .     | 6.9  | 3.5  | 2.9  | 3.8  | .2   | —    | —     | —    | —     | 2.1  | 6.2  | 2.9 in. |
| Number of days of rain | 18   | 11   | 11   | 12   | 3    | —    | —     | —    | —     | 10   | 15   | 11      |
| State of sky (0-10) .  | 6.6  | 5.9  | 6.2  | 7.0  | 4.7  | —    | —     | 2.7  | —     | 6.6  | 7.4  | 6.7     |

The amount of rain is 28.6 inches, and the number of days 81.

*La Laguna*, the highest inhabited town of any size in the island of Tenerife, is on the main carriage road, six miles from Santa Cruz and nineteen from the Puerto Oratava. It is situated on a level plain, 1800 feet above sea level. During the winter months more rain falls, more rainy days, more cloudy weather, and less sunshine than in any other part of the island, unless the Villa Oratava be excepted. The wind is rather apt to be boisterous, yet on fine bright days, which frequently occur, the atmosphere has a tonic and bracing effect. During the summer and autumn (July to November) it is frequented by the inhabitants of the coast towns, where the heat is often very great. The hotel (Hotel Aguerre) is most comfortable, being conducted in connection with the Hotel de Luna in Oratava, and the Bueno Retiro in Guimar.

Scattered along the southern slope of the peak are many villages like Adeje, Granadilla, Guia, Vila Flor, all similar to Guimar, and situated at various altitudes. They all possess sheltered dry climates, with a temperature varying according to the altitude. It is much to be regretted that, owing to their inaccessibility, they will be for a long time to come unsuitable for health resorts, so that advantage cannot be taken of one of the best districts in the whole group.



The only meteorological observations for this south part of the island are for the district of Vila Flor, which is nearly 5000 feet above sea level. They are only for one year (August, 1890, to June, 1891), and were observed by Mr. Bedlington.

*Vila Flor.*

|                     | Jan. | Feb. | Mar. | Apr. | May. | June | July. | Aug. | Sept. | Oct. | Nov. | Dec.    |
|---------------------|------|------|------|------|------|------|-------|------|-------|------|------|---------|
| Shade { Mean .      | 44·9 | 47·6 | 52·5 | 57·8 | 56·8 | —    | —     | 76·7 | 66·8  | 58·0 | 56·2 | 45·2°F. |
| temp. { Minimum     | 36·3 | 37·9 | 40·4 | 44·7 | 44·5 | —    | —     | 68·4 | 54·7  | 48·3 | 41·4 | 35·8°F. |
| { Range of          | 16·8 | 16·3 | 19·4 | 21·9 | 20·3 | —    | —     | 13·6 | 18·2  | 17·7 | 21·5 | 16·7°F. |
| Humidity, Sat.=100. | 71   | 63   | 62   | 57   | 63   | —    | —     | 36 ? | 54    | 71   | 66   | 87      |
| Rainfall, amount    | 1·7  | 2·1  | 1·6  | 1·7  | 1·8  | —    | —     | —    | ·03   | 3·8  | ·1   | 6·6 in. |
| Number of days      | 9    | 5    | 6    | 1    | 4    | —    | —     | —    | 1     | 8    | 1    | 15      |
| During daytime      | 5    | 1    | 5    | 0    | 1    | —    | —     | —    | 0     | 6    | 1    | 8 days. |
| Sunshine . . .      | 156  | 169  | 164  | 206  | 256  | —    | —     | —    | 275   | 189  | 224  | 123 hrs |

By way of comparison I give the observations made in Las Palmas at the sea level for this period.

|                     | 1891. |      |      |      |      |      |       | 1890. |       |      |      |         |
|---------------------|-------|------|------|------|------|------|-------|-------|-------|------|------|---------|
|                     | Jan.  | Feb. | Mar. | Apr. | May. | June | July. | Aug.  | Sept. | Oct. | Nov. | Dec.    |
| Shade { Mean .      | 61·1  | 61·7 | 64·3 | 65·8 | 66·7 | —    | —     | —     | 71·0  | 71·5 | 67·0 | 62·7°F. |
| temp. { Minimum     | 57·0  | 56·2 | 58·3 | 60·6 | 62·8 | —    | —     | —     | 67·8  | 67·3 | 62·8 | 58·1°F. |
| Humidity, Sat.=100. | 67    | 68   | 64   | 68   | 67   | —    | —     | —     | 70    | 70   | 69   | 68      |
| Rainfall, amount    | ·56   | ·91  | ·22  | ·20  | ·13  | —    | —     | Nil   | ·05   | 3·0  | 2·6  | 2·2 in. |
| Number of days      | 6     | 4    | 4    | 3    | 2    | —    | —     | Nil   | 2     | 6    | 12   | 16      |
| Sunshine . . .      | 152   | 210  | 237  | 220  | 203  | —    | —     | —     | 196   | 164  | 165  | 185 hrs |

*Totals.*

|                  | Rainfall.   | Number of days<br>of rain. | Sunshine.   |
|------------------|-------------|----------------------------|-------------|
| Las Palmas . . . | 9·87 inches | 55 days                    | 1732 hours. |
| Vila Flor . . .  | 18·01 „     | 50 „                       | 1762 „      |

In the island of Grand Canary the mountains do not rise to such a height as in Teneriffe or La Palma, and instead of running up to a ridge the land slopes more or less gradually from sea level to the centre of the island, twenty-four or twenty-five miles from the sea borders. This is high enough to attract a parasol of clouds, and to a certain extent it is formed, more particularly over the northern part of the island, but it is at a higher level and is not so dense as on the north



side of Teneriffe, and often absent here when present there. This parasol of cloud no doubt diminishes the sunshine, more so in the afternoon than in the morning, and is more continuous and extensive during the summer than during the winter months. The capital and port, *Las Palmas*, is situated on the extreme north-east of the island. The country in the immediate vicinity, not only of the town, but of the whole littoral, is barren, destitute of verdure and cultivation except



where water, conducted over long distances by means of stone watercourses, is available for irrigation. The town is open to the north, north-east, east, and south, but sheltered from the south-west, west, and partly from the north-west. Having gone so fully into its meteorology it is unnecessary to add anything further. There are many hotels, some in the town, others outside, but very few houses or villas are obtainable.

In the village of *Telde*, ten miles to the south of Las Palmas, the climate is very similar, but being inland three or four miles it is somewhat sheltered from the prevailing winds. In its neighbourhood there are many very sheltered places, but except two small Spanish hotels there is no accommoda-

tion. The great advantage of this place for many cases is that the climate is warm, sheltered, and removed from the immediate vicinity of the sea.

The carriage road does not extend many miles beyond Telde, as the south of the island is unproductive. In this part there are many sheltered places that would make perfect health resorts, both at sea level and inland; the climate is more sheltered, less humid, and more sunny than in the north. But for the present it is inaccessible, as the main roads naturally extend into the more productive and northern regions of the island.

Six miles from Las Palmas, at an elevation of 1000 feet, the district of the *Monte* is, I think, destined to take an important place in the health resorts of the group. The hotel, the "Bella Vista," is conducted by Mr. Quiney in conjunction with his old-established "English" hotel in Las Palmas. The district is not of the steep, rugged nature of Villa Oratava or of Icod in Teneriffe. Hence fairly level walks with beautiful scenery can be enjoyed. The ground is covered to a depth of six or more feet with lava ash; beneath this there is a loamy soil, in which are planted the roots of the vine. This is the great wine-producing district. As compared with Las Palmas there is, no doubt, a greater rainfall, more days on which rain falls and less sunshine, while the temperature is somewhat lower. I have only one winter's temperature to give; this was taken by a friend.

*Monte.*

| Shade temperatures.      | 1888. |      | 1889. |      |        |        |          |
|--------------------------|-------|------|-------|------|--------|--------|----------|
|                          | Nov.  | Dec. | Jan.  | Feb. | March. | April. | May.     |
| Means of temp.—Max.      | 65·8  | 62·0 | 58·1  | 61·0 | 63·3   | 62·8   | 65·0° F. |
| „ „ Min.                 | 57·8  | 52·5 | 50·2  | 52·4 | 52·9   | 51·8   | 54·8° F. |
| „ „ Range.               | 8·0   | 9·5  | 7·9   | 8·4  | 10·4   | 10·0   | 10·2° F. |
| „ „ Mean.                | 61·8  | 57·7 | 54·1  | 56·8 | 58·1   | 56·8   | 59·9° F. |
| Mean temp. in Las Palmas | 68·2  | 64·7 | 61·3  | 62·1 | 63·7   | 62·8   | 65·9° F. |
| Difference . . .         | 6·4   | 7·0  | 7·2   | 5·3  | 5·6    | 6·0    | 6·0° F.  |

The difference in temperature is rather greater than usual considering the altitude ; the average is  $1^{\circ}$  for every 300 feet, and here it is  $1^{\circ}$  for nearly every 200 feet.

Notwithstanding these differences, there is rarely a day when outdoor exercise cannot be taken, the climate being cooler, more bracing, and there is more inclination to take exercise. During the winter months the place can be used in many of those cases for which proximity to the sea is undesirable, and during the summer months as a mountain resort when the heat at sea level may be too oppressive. The exodus from Las Palmas during the warmer months is not nearly so general as from Santa Cruz or Oratava in in Teneriffe ; the difference in temperature in these three towns in the summer months makes this easily understood.

On the north side of the island, twenty-two miles from Las Palmas, is the small town of *Guia* ; its elevation above sea level is about 500 feet. The temperature of this place is lower than Las Palmas, and the humidity higher, as, being on the windward side of the island, it is more under the influence of any parasol of cloud that may form.

## SECTION V.

THE CLIMATE IN RELATION (a) TO HEALTH; (b) TO DISEASE;  
(c) VARIOUS LOCALITIES AND THEIR RELATION TO DISEASE.  
(d) THE FUTURE OF THE ISLANDS AS HEALTH RESORTS.

(a) *The climate in relation to health.*—From the meteorological records the climate of the Canary Islands may be considered subtropical. The group is five degrees north of the northern limit of the torrid zone, and the annual isothermal line of 70° F. passes through this region. Although there is this high mean temperature, yet the amount of moisture present in the atmosphere is comparatively small; these two conditions combine to make the climate even at sea level suitable for health purposes. The degree of moisture is a good guide in deciding whether any climate is healthy or unhealthy; more especially is this the case in tropical regions. An excessive degree of humidity, from whatever cause, is detrimental to health, and is associated with states of debility and lassitude; whilst dysentery, malaria, and other tropical diseases are much more likely to be endemic. These meteorological con-

### *Lagos—Humidity.*

| Means of           | Jan. | Feb. | Mar. | April | May.  | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec.           |
|--------------------|------|------|------|-------|-------|-------|-------|------|-------|------|------|----------------|
| Shade temp. { Max. | 83·0 | 85·0 | 87·0 | 86·1  | 85·0  | 82·0  | 79·0  | 79·0 | 79·0  | 81·0 | 85·0 | 85·0° F.       |
| { Min.             | 75·0 | 77·0 | 78·0 | 76·0  | 75·0  | 72·0  | 71·0  | 71·0 | 71·0  | 71·0 | 71·0 | 75·0° F.       |
| Humidity:          |      |      |      |       |       |       |       |      |       |      |      |                |
| 8 a.m.             | 87   | 83   | 79   | 77    | 80    | 81    | 86    | 83   | 84    | 85   | 81   | 91 } Sat.      |
| 4 p.m.             | 73   | 70   | 77   | 71    | 78    | 76    | 80    | 76   | 78    | 76   | 75   | 70 } =100.     |
| Rainfall           | 1·65 | 1·09 | ·39  | 6·02  | 10·94 | 15·19 | 10·18 | 1·89 | 3·66  | 9·07 | 1·49 | ·3 = 61·67 in. |
| No. of days        | 2    | 4    | 3    | 8     | 11    | 12    | 10    | 8    | 10    | 13   | 4    | 1 = 86 days.   |

ditions are very well exemplified by those observed at Lagos, the capital of the colony of Lagos, on the west coast of



Africa, which I am enabled to give through the courtesy of Sir Alfred Molonay, the late Governor, and now Governor of British Honduras.

There are few places on the sea-coast or at sea level, in or near the tropics, which possess a sufficiently low degree of humidity. Even in South Africa, Cape Town, Port Elizabeth, and Durban cannot be considered as health resorts, even though no rivers or marshes are in the neighbourhood. The same may be said of the coast towns of most parts of Australia, especially towards the north. Nor can the coast towns of South and North America, below the thirteenth parallel, be used as health resorts on account of the debilitating effects of an excess of humidity associated with a high mean of temperature. In all these regions the healthy residential places are inland, and at some elevation above sea level. In the Canary Islands the degree of humidity varies, yet it is never so excessive as to prevent continuous residence or to interfere with health. Situated as they are, nearer the equator than any other northern health resorts of the Western Hemisphere, *they possess the two advantages of warmth and dryness.* In Las Palmas, residence through the summer and autumn is continually practised, the heat being tempered during the hottest months by the continuous northern winds. In Teneriffe, Santa Cruz and Oratava do not receive the full benefit of these winds, and on this account the temperature is slightly higher; but close at hand with a lower temperature there are the resorts of Icod, Villa Oratava, and Laguna, the splendid condition of the roads allowing a change of residence to be easily accomplished. Another great advantage is the proximity of the group to England and the Continent; within five days of Plymouth, six of London, seven of Liverpool, five of Genoa, four of Barcelona, and two of Cadiz, these islands are in constant communication with the outer world. In addition they are also the ports of call for high-class passenger steamships bound for Montevideo, Valparaiso, the Cape, Australia, and New Zealand; whilst intercourse can be had with the West Indies and America by way of Puerto Rico and Cuba.

To those, however, who wish the gaieties and distractions that may be found in the Riviera, Egypt, &c., life in the

Canary Islands may be disappointing. Beyond riding, tennis, golf, picnics, and other social amusements, there is very little to pass away the time. Whether in the future this will be remedied remains to be seen. The chief thing against them is that the affairs of this life do not move very fast on Spanish territory; grass is apt to grow under foot whilst we wait till the fugitive "mañana" (to-morrow) is overtaken. Still there are some people who seem always to be idle, yet busy, and find the time short even when visiting the islands; they are usually happy and contented wherever placed. If out for health purposes they usually improve, but in a great measure for the reason that there is no tonic so good as a personal interest in anything that will distract attention from some particular, perhaps morbid repinings. There can be no doubt that an inoffensive hobby of any description is urgently necessary for many who have been obliged temporarily to leave their accustomed anchorage, and find themselves with time hanging heavily on their hands. The outdoor life that is so necessary and can be so easily obtained in the Canary Islands allows of many hobbies to be pursued under most favorable circumstances; painting, photography, botany, marine zoology, natural history, geology, &c., can all be made to render full of interest many an otherwise dull hour.

For a healthy mode of life in these regions it need only be slightly modified from the English style; the same summer clothing, the same food, though with more fruit and vegetables, but with less meat; above all, temperance, not necessarily teetotalism; and lastly, a fair amount of exercise, whether in walking or riding. The dangers of a warm climate are not confined to diseases of the respiratory mucous membrane, as a chill may settle on the liver and bowels, and be more mischievous than one on the lungs. The birth-rate amongst British subjects is certainly above the average, and children born of British parentage thrive very well, provided they obtain plenty of open-air exercise, and care is taken in their diet.

(b) *The climate in relation to disease.*—In discussing this question I do not intend entering into the relative merits of the climate of the Canary Islands compared with those of

other health resorts, whether warm or cold, dry or moist, high or low. One climate may suit one case and be prejudicial to another; each case should be judged by itself.

In considering this subject it is necessary to approach it on broad general principles, and of necessity there must be included in it some notice of the main factors of climate as a therapeutic agent in disease.

It may suffice to roughly classify climates as twofold, those that are cold and those that are warm. By the former I mean those that have as their main characteristics a low shade temperature with a low degree of humidity, whether they are found at high levels as at Davos, or low levels as in Labrador. By the latter I mean those that have a high minimum temperature during the winter months, whether marine or inland, and that possess no high degree of moisture, the main factor in the degree of temperature being proximity to the equator. All warm climates are enervating, while cold climates are bracing. The physiological functions are performed under different circumstances in the different climates. Take, for example, the question of diet. The colder the climate is, the more nitrogenous and fatty food is requisite; whilst nearer the equator not only is less of this class of food required, but the quantity and quality are not to be obtained.

Those who go abroad for change of air during the winter months may be roughly divided into four groups:

1. Those who go abroad for pleasure.
2. Those who go abroad to escape the winter's cold, but are otherwise healthy.
3. Those who suffer from ill-health and disease that do not in themselves cause death or even shortening of life (so-called functional diseases).
4. Those who suffer from structural diseases, or diseases that in time produce structural changes (so-called organic diseases).

The above distinctions are not fundamental, though they are convenient; No. 3 in particular dwindles year by year, while No. 4 enlarges its boundaries. Those comprising the first group can be easily dismissed, for as long as the time passes pleasantly, warmth and cold, dryness and



moisture, are nothing, provided these do not interfere with their enjoyments.

The second class are very different; for these a warm climate is essential, and the warmer the climate is, it is the more enjoyable. Often they are people who, having spent the whole or greater part of their lives in a warm climate, and having borne the burden and heat of the day, can live in England during the summer months, but, like swallows, seek a warm climate for the winter. They, as a rule, are accustomed to live out of the British Islands, and perhaps prefer foreign modes of life. To them discomforts are at a discount, whilst the increase in warmth is part of their very existence.

It, no doubt, adds to the prolongation of such lives and to the great material interests often dependent on them, but the continuance of life is first and foremost.

For such cases the Canary Islands offer many and great advantages, and it is not a matter of surprise that this class appear to arrive in greater numbers every year. At the present time there is an old Anglo-Indian who returns to these islands winter after winter; although he is eighty-three years of age, yet he comes, and a wonderfully active life he enjoys, that probably had failed ere this if he had wintered at home. This prescription is of ancient date, for we find it was ordered and applied in another form long before the Christian era. The other two classes differ from the former in their condition of ill-health. Those in class 4 are in a more or less unpromising state.

For those suffering from functional diseases, where there is a malperformance of the working machinery, complete change of scene is often by far the best medicine that can be prescribed. These cases, however, must be able to stand the fatigue of travelling, the altered conditions of life, often hotel life,—above all, to be happy, contented, away from friends and home. These cases can be roughly divided according as a warm or cold climate is indicated. The question of diet, the state of digestive, circulatory, and nervous systems in warm or cold weather, are important elements in the choice of climate, and may often give an infallible indication of whither to go. The great points in favour of the Canary Islands for such



cases are that an outdoor life can be enjoyed during at least parts if not during the whole of every day through the winter months, with an atmosphere of the high mean of 64° F. During the night also abundance of fresh air is available, as, with the high minimum night temperature and little rainfall, the windows of the bedroom can remain open. If the heat is too oppressive at sea level there are the mountain regions, where all grades of temperature can be obtained. In addition, the high average of sunshine has a most beneficial effect, with no gloomy depressing weather and its baneful effect on such cases. By these means a warm climate like the Canaries has a tonic stimulating effect, promoting appetite, producing sleep and strength of will; but it does not produce tissue changes to as great an extent as a cold invigorating climate. For this reason a cold climate may be more beneficial in many cases, provided it can be well borne. When the deranged system once begins to work satisfactorily, there is usually no reason why it should not continue even under altered conditions; it is this class that gives the most satisfactory results from change of climate for a few months, and in this respect they differ very considerably from those in which there are structural diseases.

In these cases, with their degenerative changes, the value of climatic treatment is in inverse proportion to the extent and acuteness of the disease. In many cases it can only be palliative, making the organs to work under more favorable conditions, and if possible securing the gradual subsidence of the disease into a quiescent state.

Naturally this class can be subdivided into the acute and chronic cases. For the former, where changes are progressing rapidly, climate can be of little avail as a curative agent; on the contrary, the fatigue of travelling, with the discomforts attendant on foreign life, may perhaps hasten the end. The only one redeeming feature in sending these cases abroad to a warm climate is that an outdoor life is possible even to the very end, whilst if they stay at home their later days are spent in one or two rooms; but taking everything into account, the disadvantages of travelling outweigh the advantages of the climate.

In subacute or chronic cases the beneficial effect from change of climate entirely depends on the extent of damage and duration of the disease. The more acute the disease is and the greater its extent, the result must be the less favorable. In the far advanced stages the same remarks apply as to those in the acute stages. Perhaps there may be more chance of a subacute passing into a chronic stage and a chronic into a quiescent, and thus enabling the patient to live a fairly active, healthful life. But for this good result there should not be disease to any great extent, nor any rapid progress of it; even then time is the great factor. To many time and expense are no object, and to these health is the first consideration; but there are many others to whom the questions of occupation and livelihood have of necessity to come before health.

In the early stages of disease health and occupation may often be advantageously combined in a warm climate, impossible in the British Islands. Where the majority of these cases fail is that everything else is tried first; and then, when everything else fails, change of climate becomes the dominant idea, and, if carried out at that late period, it usually ends in disappointment. This is not to be wondered at, as the giving up of a certain occupation for an uncertain one is not a thing to be undertaken lightly for what may in the beginning be considered some trifling ailment.

For such cases the Canary Islands offer few advantages; the most of the work, even in English homes, is done by Spaniards. Spanish ways and a knowledge of the language are essential to any business. Agriculture cannot at present be made profitable by foreigners. Captain Harford, in his last consular report, seems to think that capital might be employed in dairy farms, but as all Britishers (Ingleses) are looked upon as lawful prey a knowledge of Spanish customs and language would be very necessary.

This question of living permanently in a more congenial climate is intimately associated with the question of the duration of a visit necessary for these cases. It goes without saying that a short visit of a few weeks is not of much avail towards rendering quiescent a state of organic mischief, or

perhaps towards any improvement. However slight the extent, reparation must be slow, and, when completed, the part for a long time will be very sensitive towards any adverse influences,—quite as sensitive as in the case of a newly-healed wound, that may break down from a slight blow or even from general ill-health.

Change of climate, even at its cheapest, is an expensive prescription, but where financial conditions do not enter into the case this question need not be considered. However, now-a-days, with steamship competition, change of climate is being opened up to a much wider circle, and those take advantage of it to whom, a few years ago, it would have been beyond reach, and who even now are obliged to curtail their visit. Leaving a warm climate for a more uncertain and colder climate cannot but be fraught with danger, and the greatest care should be taken that invalids do not return until there is some chance of warm weather at home. Over and over again have I seen most disastrous results from returning early in the year, as living for any length of time in a warm climate produces in those that are delicate a certain amount of susceptibility to cold, damp weather. In the case of the Canaries the majority of persons are not able to journey home in short easy stages. In these days of quick steamship travelling, within forty-eight hours an invalid may be plunged into cold wintry weather, out of which there is no escape. It is better to come late and leave late than to come early and leave too early. For the cases where financial matters are a great object it might be advisable never to venture, but to expend part of the extra outlay in obtaining more comforts in some of the health resorts on the southern coasts of England.

(c) *The various localities and their relation to disease.*—In considering the question of the application of the climate to disease it is rather the fashion to make out that this, that, or the other place possesses an infinitely superior climate and advantages. The natural sequence is, that the special locality, often only an hotel, is warranted, like many quack remedies, to effect more certain and speedy benefits.

One locality of the group may differ in a minor degree



from another, but it is illogical to claim for any place, perhaps not more than a few acres in extent, being a certain specific against all the ills of this life.

As I have shown, there are variations, and these, instead of vaunting the place above all others, should be looked upon as clinical indications.

In the following pages I have attempted in a brief manner to place on a better footing the therapeutical benefits of the different localities.

The best method to follow in this section will be to arrange the diseases under the various systems, and briefly to indicate the advantages and disadvantages each place possesses.

Beginning with that class included under the term of specific infectious diseases, the majority of them are outside the pale of climatic treatment.

There are no forms of malaria endemic in the Canary Islands. Those which are seen are usually from the West African coast, and comprise ordinary cases of ague, remittent fever, and the so-called black-water fever, the African hæmoglobinuric fever. I think this latter term is a misnomer, as there may be hæmorrhages from other organs than the kidneys. The effect of better food, accommodation, and general hygienic surroundings on these cases is marvellous. On the coast, where such cases go from bad to worse, often the only chance is to put them on board a homeward steamer, in the forlorn hope that they may be able to survive the first few days, as then, in all probability, the Canary Islands will be reached. A few weeks' residence causes the ghastly, anæmic, shrivelled look to disappear, and, like the mythological phoenix, a new man rises out of the ashes of the old. For these cases towns at the lower levels are to be preferred during the winter months; during the summer months they are usually able to return to England, though the higher regions of the Canary Islands could be utilised with benefit. Grand Canary is the great depôt for the west coast, and so perhaps more of these cases are seen there than in Teneriffe.

The cases of specific disease likely to be benefited by a warm climate are the laryngeal, and these will be considered later.



Tubercular and strumous tendencies, especially in children, are often benefited by residence. After a short time fresh vigour and life appear to be infused, but this is when there is no active disease, but only a strong tendency to drift into tubercular deposit, or rather for tubercular deposit to drift into them. For these cases the higher parts of the Valley of Oratava and Icod, in Teneriffe, with Las Palmas and the Monte in Grand Canary, are to be preferred. During the summer months sea-bathing has a good invigorating effect. This can be enjoyed all the year round, as the temperature of the sea water is uniformly high. But the general custom is to indulge in it only during the warmer months (June to October). Owing to long stretches of sandy beach, Las Palmas is particularly well adapted for bathing, but care should be taken of the sea currents that run with strength around the coasts. In these cases great attention should be paid to diet, and this is always difficult if living in hotels.

*Diseases of the nervous system.*—Acute forms are naturally contra-indicated; in chronic forms little benefit can be expected from mere residence, the benefit lies in the open-air life available during the whole year. In these cases the more sedative climate of the lower part of the valley of Oratava are preferable, or Santa Cruz, or Guimar in a minor degree. Cases of nervous irritability, loss of nervous energy, mental depression, sleeplessness, &c., due to non-structural changes, usually improve best at the higher levels and at a little distance from the sea. Localities like Icod, Villa Oratava, Laguna in Teneriffe, with the Monte, Guia in Grand Canary, will be found the most suitable. The various forms of neuralgia are due to so many causes that it is necessary to take the specialities of each case into consideration. If digestive troubles are the cause, the higher elevations should be selected, if of rheumatic origin Santa Cruz, Guimar, and the town of Las Palmas should be preferred; if due to nervous debility (a rather vague term) then the higher elevations should be sought. In all these perversions of the nervous function the main benefit of the climate of the Canary Islands is that out-door exercise of some description can be taken day after day during the winter months.

*Diseases of the digestive system.*—These, as a general rule, are not benefited by a warm climate, particularly where the liver is at fault. Perhaps in those cases of dyspepsia due to overwork and confinement in an office with irregular hours, the complete absence from business, from daily postal arrangements, combined with plenty of exercise, often cause a considerable improvement. Cases of catarrh, ulceration of the stomach or intestines are contra-indicated, and these conditions, likely to occur in the course of other diseases, make them also unsuitable. The same thing applies also to cases where the liver function is at fault. In all these cases the coast towns are more prejudicial than those at some elevation, such as Icod, Laguna in Teneriffe, and the Monte in Grand Canary. In any tendency to digestive disorders greater attention should be paid to diet than even when at home; this in hotels is always more difficult than in private houses, particularly in regard to stimulants and the native wines.

*Diseases of the urinary organs.*—Cases of nephritic changes, whether primary or secondary, are naturally more suited for a warm climate than a cold, and a humid climate is more beneficial than a dry one. As a general rule, these cases should reside fairly near the sea level. In those localities sheltered from the full force of the wind Puerto Oratava, Santa Cruz, or Guimar produce a better result than the outskirts of Las Palmas, which are less to be preferred than the town of Las Palmas. In the region of Telde there are many beautifully sheltered situations, but the accommodation at present is very meagre. I am rather inclined to think that Funchal in Madeira may be the climate *par excellence* for these cases. If these nephritic cases are complicated with cardiac mischief, the lower part of the Puerto Oratava or the town of Las Palmas is preferable. In these places there are level walks with a maximum of shelter. If, in addition, there are hepatic or digestive ailments, and these the main symptoms, then such cases would be contra-indicated.

*Diseases of the cardio-vascular system.*—A warm climate can effect little direct benefit in these cases. The beneficial effect is more prophylactic, preventing bronchial attacks, which

cause increased mischief. Steep localities like Icod, Villa Oratava, and some parts of the Puerto Oratava are, therefore, contra-indicated. Level walks are obtainable in Santa Cruz de Tenerife, Las Palmas, Laguna, and the Monte. The most suitable locality for these cases depends on the irritability of the bronchial mucous membrane. If a cooler temperature can be borne, the higher elevations are to be preferred.

*Diseases of the respiratory system.*—Without entering into the relative merits of cold or warm climates for the treatment of these diseases, there are in the Canary Islands a choice of climates with different aspects, and at different altitudes. Acute cases may be altogether omitted, as they are entirely contra-indicated. The most suitable locality is where home is situated.

Cases of laryngeal disease are contra-indicated where there is much dust or wind. The sheltered parts around the Puerto Oratava are in many ways the most suitable; in a minor degree Santa Cruz and, at a higher level, Guimar. The outskirts of Las Palmas are contra-indicated, though a certain amount of shelter can be obtained in the town. During the summer months the Monte in Grand Canary provides an agreeable and beneficial change.

In cases of asthmatic tendency the majority discover for themselves the most suitable locality. The best results have been obtained in Santa Cruz de Tenerife and in Las Palmas, where many cases are able to breathe freely; for those who can bear lower temperature I have seen good results from Icod in Teneriffe, and from the Monte in Grand Canary, while the upper part of the valley of Oratava is much better than the lower. The reason why the lower parts of the valley of Oratava are contra-indicated may be due to the spray from the sea-surf being blown inland, having an irritating effect on the mucous membrane, and reflexly causing the spasmodic condition.

The atmosphere of the lower part is said to be much richer in ozone than the upper, and this may make the vital difference.

Similarly in bronchitis very much depends on the irri-



tability of the mucous membrane. Those cases which do not require much shelter may find the outskirts of Las Palmas the best locality, and in a minor degree Santa Cruz. If a more sedative, humid climate is desired, then Puerto Oratava might be tried. With the majority of these cases the more stimulating climates are the best. During the winter months localities at higher levels are as a rule contra-indicated, though during the warmer months they afford a most beneficial change instead of returning to the uncertain weather of a British summer.

In cases where the pleural surfaces are mainly affected Santa Cruz and Las Palmas are the most suitable at first, and afterwards the higher levels at Icod, the Monte, and Laguna; but in coming to the latter place the pleurisy should not even be in a subacute stage, nor liable to become so.

In those cases where the lung substance is affected very much depends on the extent and progress of the disease, and perhaps also on the diathesis of the individual. The acuter forms are contra-indicated, the more advanced and feebler cases should be sent to the more sheltered parts of the valley of Oratava, where the climate has a more sedative effect. Guimar and the less exposed parts of Las Palmas are also fitted to be useful and palliative. The earlier cases, in stronger and more robust health, with no loss of lung tissue, especially those with no hereditary tendencies, are more suitable for the upper part of the valley of Oratava and the outskirts of Las Palmas. The higher level at Icod in Teneriffe and the Monte in Grand Canary may prove even more beneficial in such cases, for if a spell of bad weather comes in these higher altitudes, in one or two hours anyone can move down to the lower and warmer regions. During the warmer months these inland resorts may be utilised with great benefit.

In the cases of pulmonary disease, where hæmorrhagic tendency is the chief feature, the result is rather uncertain. If this tendency is hereditary, a warm climate has little or no effect. If the disease is progressive, the prognosis is unfavorable. In the Canary Islands I have noticed that a low



barometric pressure seems to have a predisposing effect, in some cases, to an attack of hæmoptysis. The higher and the more exposed situations are undesirable.

*In diseases of the blood, &c.*—Cases of pernicious anæmia, leuchyæmia, and Hodgkinson's disease are none of them likely to be benefited by change of climate. In cases of anæmia or chlorosis due to no organic disease, if full advantage is taken of outdoor life, this tendency may be counteracted. The lower temperature of Icod and the Monte will be found more beneficial than the warmer sea-coast towns. In diabetes I have seen good results in one case, where the sugar disappeared, the specific gravity fell to normal, and the amount of urine diminished. For these cases the warmer situations are to be chosen. Arrangements, however, should be made for the special articles of diet to be sent periodically from England, as otherwise they are unattainable.

*Diseases of bones and joints.*—Acute tubercular diseases are little affected, though the continuous outdoor life will have a beneficial and prophylactic effect on the general health. If the disease is local, the higher situations may be found to be the best.

In rheumatic cases of the chronic form the driest climate is the most suitable. Santa Cruz or Las Palmas at sea level should be chosen. To begin with, these cases should remain at the lower levels during the winter months, during the warmer months at Icod, or the Monte, or Laguna. Flannel should be worn next the skin and changed twice a day. In chronic rheumatic arthritis, in its early stages, before permanent articular changes have set in, particularly in children, residence in the warmer and drier situations has often a most beneficial effect. In cases of gouty affections, and in a gouty tendency generally, a very strict attention should be paid to diet, and especially to the avoidance of acid wines (native), malt liquors, and oranges.

In cases of rickets in children a continuous residence with a maximum of outdoor life are necessary. The cooler, more bracing parts ought to be chosen. Sea-bathing is especially useful in these cases, and this may be enjoyed all the year round.

(d) *The future of the islands as health resorts.*—This cannot at present be accurately predicted. Fashion and advertising may make or mar a place independently of its excellences. This group of islands with Madeira form a unique cluster of winter health resorts, the temperature of which is raised by the heat of a sub-tropical sun and by the radiating influence of the Gulf Stream, and yet is tempered by the refreshing breezes of the Atlantic Ocean. These islands are characterised by a high mean temperature, a large average of sunshine, and a humidity diminishing from Madeira through Oratava, Santa Cruz, *to the more stimulating and dry climate* on the east coast of Grand Canary. Teneriffe and Grand Canary have the further great advantage of excellent roads, allowing easy and rapid access to the higher and cooler mountain regions.

Considering the temperature, sunshine, rainfall, and humidity of the group the climate is unsurpassed. It is also rare, if not unique, to find so many variations of a climate in so small a compass, yet all possess distinct advantages and adaptations. The most sheltered, driest, and sunniest climates are towards the south of the islands, but are at present entirely away from the principal ports. Roads are now being made in these districts in La Palma, Teneriffe, and Grand Canary, and in time may be opened up. In these districts of the two latter islands springs of water are scarce, and this may effectually prevent any development. The two eastern and the three western islands will never be extensively used as health resorts until their ports become centres for steamer traffic, of which at present there is no possibility.

From a climatic point of view the two eastern islands are the only two that are worth developing.

The name of A. L. Jones, Esq., the head of the Liverpool firm of Elder Dempster, agents for the African Steamship Companies, will, in particular, be associated with the opening up of the islands as health resorts.

In Grand Canary a forward move was made when the hotel at the Monte was started. The new hotels in Las Palmas have been built just outside the town, and are very pleasant and cool, yet they would have been better with a

little more available shelter. There is more shelter in the hotels in the town, but the surroundings are not so agreeable.

Santa Cruz de Tenerife possesses two small hotels, but visitors usually rush through direct to Oratava. A large hotel built outside the town on the road to Laguna would obviate this, and allow one of the best winter climates of the group to be utilised. Health resorts, as a rule, never develop to any extent unless there are private houses, villas, or flats to suit the requirements of a very numerous class who will not reside in hotels. The want of private houses is a most serious obstacle to the development of Santa Cruz and Las Palmas.

In Oratava, on the contrary, speculators have been wise in their generation, and have opened up hotels and villas at all levels. From this wise forethought Oratava bids fair to become the principal health resort of the group, notwithstanding the long drive of twenty-four miles from Santa Cruz, and that other places possess better climates.

In other countries the government and municipal authorities have taken the improvements in hand year by year, completing and perfecting them. Although Spain has several beautiful and sheltered climates that would make perfect Rivas, yet after a certain point nothing more is heard of them. In the case of these islands the movement is almost entirely due to the competition and enterprise of the steamship companies, and if it were not for them the islands would soon be left to their original seclusion. The inhabitants do not seem to have any idea of *pensions* or furnished apartments similar to British and Continental health resorts. With the increase of shipping and number of visitors the price of food has risen to more than twice what it was three or four years ago. There will always be variety in fruit and vegetables, but the islands cannot continue to raise the number of cattle, &c., necessary for the present consumption; this is evinced by the high price to which meat has risen. It would be a great boon if facilities were given for the importation of frozen meat from the steamers that call on their way to England from Australia and the River Plate. Servants are plentiful, their wages low, and if their language is

understood they are not difficult to manage, only constant supervision is necessary.

The absence of customs duties and all restrictions on personal baggage is a great boon to visitors, but notwithstanding all these advantages the sea passage will always militate against any extensive annual immigration, and will, no doubt, deter a large number who do not care to experience the misery of *mal de mer*.



## SECTION VI.

### PUBLIC HEALTH OF THE ISLANDS.

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BIRTH-RATE, DEATH-RATE (GENERAL, PHTHISICAL) DRAINAGE, WATER-SUPPLY.

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*Public health of the islands.*—It may truthfully be said that in no country is the science of sanitation and hygiene so well carried out as in the British Islands, and it follows that the conditions of public health in the Canary Islands fall very short when any comparison is made. To compensate this there are several natural conditions that counter-balance the effects of the general want of sanitation due to whatever cause. In the first place the constant movement of pure air from the Atlantic Ocean, the high average of sunshine, and the low degree of humidity play an important part, and, last but not least, the population is fairly well scattered, and the major part engaged in agricultural pursuits. All these conditions permit with impunity a much greater laxity in sanitary affairs. Statistics are not easily obtained and may not be quite reliable, yet I will give those I have collected.

Commencing with the Island of Grand Canary and with its capital, Las Palmas, the population of which is given at 22,000, though probably the real figure is higher, the only statistics I can obtain are as follows :

| Year. | No. of births. | No. of deaths. | Excess of births over deaths. |                                                                                                                   |
|-------|----------------|----------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 1887  | 948            | 614            | 334                           | The figures for 1891 are for the first eight months, and the heavy mortality was due to an epidemic of small-pox. |
| 1888  | 901            | 695            | 206                           |                                                                                                                   |
| 1889  | 1000           | 569            | 431                           |                                                                                                                   |
| 1890  | 905            | 653            | 252                           |                                                                                                                   |
| 1891  | 658            | 608            | 50                            |                                                                                                                   |

As typical of a country district, the following statistics are taken from a pamphlet by Dr. Frederico Leon, of Las Palmas, entitled the 'Vega of San Matteo.' The district of San Matteo is towards the centre of the island, from two to four thousand feet above sea-level, and the population was nearly 5500.

Of these 2500 were males, 2824 females ;  
 2981 were unmarried, 2030 married ;  
 253 were widows or widowers, and  
 63 were without classification.

978 knew how to read and write, 334 to read only, while 4012 knew neither how to read or write.

| <i>Ages were as follows :</i> |   |   |      | <i>Professions.</i>      |   |   |      |
|-------------------------------|---|---|------|--------------------------|---|---|------|
| Less than 1 year              | . | . | 110  | Agricultural labourers   | . | . | 4211 |
| Between 1— 10 years           | . | . | 822  | Scientific professions . | . | . | 2    |
| „ 10— 25 „                    | . | . | 1292 | Skilled artisans .       | . | . | 333  |
| „ 25— 40 „                    | . | . | 1931 | Servants .               | . | . | 92   |
| „ 40— 70 „                    | . | . | 1005 | Without classification   | . | . | 686  |
| „ 70—100 „                    | . | . | 360  |                          |   |   |      |

These figures coincide with those of the census of 1887, where the total population of the group was returned at 291,589 persons. Of these 80·1 per cent. could neither read nor write, 4·4 per cent. knew how to read, but not to write, while 15·5 per cent. knew both rudiments.

The births and deaths are calculated for fifteen years. The births arranged according to the months show the birth-rate is higher during the winter months than the summer months.

The yearly average is 65 males and 63 females, making a total of 128 for the whole year. The deaths show that the highest mortality is in August and September, and that the average number of deaths per annum is 65 (29·8 males, 35·1 females). For this district there is also given a classification of cause of death for the six years 1881 to 1886, and this shows that the greatest mortality is amongst children, and that diseases of the lungs and bowels are the main factors.

Turning from the island of Grand Canary to that of Tenerife, the village of Vila Flor stands at a height of about five thousand feet, and it has a population of about one thousand. There are no statistics similar to those of San Matteo, but in ten years there were 138 deaths, of these—

|    |                                        |
|----|----------------------------------------|
| 63 | were returned as dying under 10 years. |
| 47 | „ „ „ 1 year.                          |
| 16 | „ „ between 1— 10 years.               |
| 11 | „ „ „ 60— 70 „                         |
| 16 | „ „ „ 70— 80 „                         |
| 19 | „ „ „ 80—100 „                         |

Leaving twenty-nine people who died between the ages of ten and sixty years, or an average of 2·9 per annum, I have no statistics of classification, but in these island districts the conditions of life are so similar that what applies to one district may be made to apply to another. The statistics for the valley of Oratava are taken from Dr. Zerolo's work on 'Tuberculosis y Clinatherapeutica.' I have arranged them with the other districts, and omitting the district of Realajo Alto, it may be noted that the greater the population is the higher is the death-rate, and that as the altitude increases both tend to decline.

| Name of district.         | Altitude. | Population. | No. of years' statistics. | Birth-rate per 1000. | Death-rate per 1000. |
|---------------------------|-----------|-------------|---------------------------|----------------------|----------------------|
| Las Palmas . . .          | Sea level | 22,000      | 5 years                   | 43·0                 | 28·0                 |
| Santa Cruz, Teneriffe . . | „         | 20,756      | 5 „                       | 22·0                 | 23·0                 |
| Puerto Oratava . . .      | „         | 4,295       | 11 „                      | 35·8                 | 18·7                 |
| Realajo Bajo . . .        | 1000 feet | 3,673       | 11 „                      | 28·7                 | 15·0                 |
| Villa Oratava . . .       | 1100 „    | 8,300       | 11 „                      | 41·6                 | 25·1                 |
| Realajo Alto . . .        | 1200 „    | 2,700       | 11 „                      | 55·5                 | 27·2                 |
| San Matteo . . .          | 3500 „    | 5,000       | 15 „                      | 24·0                 | 13·0                 |
| Vila Flor . . .           | 4310 „    | 1,000       | 10 „                      | 32·0                 | 13·8                 |

I cannot obtain any statistics for the capital, Santa Cruz de Tenerife, but, according to the figures given in the local paper of Las Palmas, the death-rate there far exceeds the birth-rate. It is difficult to say how much reliance should be put on that statement.

Phthisis amongst the inhabitants has been considered from time immemorial a much more infectious disease, I should imagine from the precautions taken, than smallpox, measles, typhoid, fever, diphtheria. The laws concerning it, if properly carried out, are most stringent. Taking into consideration that the Canarians are not of pure blood, but a mixture of more than one race, and that, owing to difficulties of communication, intermarrying between allied families is

not uncommon, a certain predisposition may be expected. The type of phthisis among the inhabitants is of a rapid variety and runs a speedier course at sea level than at a higher altitude. Spaniards afflicted with this disease always arrange if possible to live away from the sea and at some elevation, as it prolongs life. The only statistics I can obtain rather bear out this idea, for, according to Dr. Zerolo (op. cit.), the mortality in the Puerto Oratava and Villa Oratava, estimated for eleven years (1873—1883) and before these places became health resorts, show that the deaths from phthisis for the Villa Oratava were one in 32·8, deaths from other causes, and in the case of the Puerto Oratava, one in 16·8 deaths. The above figures are combined in the following table with those for Laguna and Santa Cruz, but for these I cannot give the exact authority.

|                              | Altitude.     | Mortality from phthisis per 1000. |
|------------------------------|---------------|-----------------------------------|
| Santa Cruz de Tenerife . . . | Sea level ... | 2·61                              |
| Puerto Oratava . . .         | „ ...         | 1·10                              |
| Villa Oratava . . .          | 1100 feet ... | ·67                               |
| Laguna . . .                 | 2000 „ ...    | ·65                               |

{ 1·81 is the amount given for  
Oratava by the same authority  
as for Santa Cruz and Laguna.

Taking the province of Canary as a whole, phthisis is less prevalent than in any other country. The following statistics for Spain are for five years, they are taken from Government sources, and quoted in Dr. Zerolo's work.

| Province.           | Description.            | Latitude. | Population. | Death-rate per 1000. | Phthisical death-rate per 1000. |
|---------------------|-------------------------|-----------|-------------|----------------------|---------------------------------|
|                     |                         | North.    |             |                      |                                 |
| Canary . . .        | Islands, Atlantic       | 28° 24"   | 289,673     | 19·26                | ·76                             |
| Balearic . . .      | Islands, Mediterranean  | 39° 33"   | 295,170     | 20·32                | ·98                             |
| Malaga . . .        | Coast, Mediterranean    | 36° 43"   | 509,171     | 34·12                | 1·11                            |
| Almeria . . .       | Do.                     | 37° 11"   | 354,619     | 22·40                | ·69                             |
| Granada . . .       | Inland                  | 37° 11"   | 482,245     | 27·55                | ·76                             |
| Cadiz . . .         | Coast, Atlantic         | 37° 23"   | 430,536     | 32·90                | 1·97                            |
| Seville . . .       | Inland                  | 37° 49"   | 512,973     | 30·04                | 2·47                            |
| Huelva . . .        | Coast, Atlantic         | 37° 50"   | 213,580     | 24·15                | ·90                             |
| Murcia . . .        | Coast, Mediterranean    | 37° 54"   | 457,765     | 30·54                | 1·25                            |
| Alicante . . .      | Do.                     | 38° 21"   | 415,077     | 29·86                | ·80                             |
| Badajoz . . .       | Inland                  | 38° 54"   | 441,303     | 30·62                | 1·69                            |
| Valencia . . .      | Coast, Mediterranean    | 39° 28"   | 688,768     | 25·45                | 1·10                            |
| Madrid . . .        | Inland                  | 40° 24"   | 593,370     | 38·20                | 3·03                            |
| Barcelona . . .     | Coast, Mediterranean    | 41° 22"   | 843,498     | 28·86                | 1·91                            |
| Bilbao . . .        | Coast, Bay of Biscay    | 43° 15"   | 193,233     | 28·70                | 2·66                            |
| San Sebastian . . . | Do.                     | 43° 19"   | 171,170     | 29·90                | 2·26                            |
| Corunna . . .       | Coast, north-west point | 43° 22"   | 602,532     | 24·10                | 1·70                            |
| Santander . . .     | Coast, Bay of Biscay    | 43° 29"   | 236,993     | 23·12                | 1·84                            |



To compare with these I have taken from Hirsch's work on 'Geographical and Historical Pathology' the following statistics of the mortality from phthisis in other countries, and give them here for what they may be worth.

|                       |                        |                        |
|-----------------------|------------------------|------------------------|
| England:              | Switzerland:           | Rio Janeiro . . . 5.0  |
| Northern Counties 2.6 | C. Grison . . . 2.5    | Monte Video . . . 4.0  |
| Southern Counties 2.4 | C. Schaffhausen . 2.1  | Melbourne . . . 2.2    |
| Yorkshire . . . 2.8   | C. Zurich . . . 1.9    | San Francisco . . 2.8  |
| Wales . . . . 3.2     | C. Berne . . . . 1.9   | Boston . . . . . 3.3   |
| Norway . . . . 2.3    | Belgium . . . . 3.5    | New York . . . . 4.1   |
| Sweden . . . . 3.5    | Italy:                 | London . . . . . 3.6   |
| Denmark . . . . 2.5   | Lombardy . . . . 3.3   | Edinburgh . . . . 3.0  |
| Saxony . . . . . 2.4  | Piedmont . . . . 2.8   | Brussels . . . . . 4.8 |
| Bavaria . . . . . 3.4 | Sardinia . . . . . 1.7 | Copenhagen . . . . 3.0 |
| Baden . . . . . 2.7   | Sicily . . . . . 1.4   | Paris . . . . . 4.2    |
| Hesse . . . . . 2.7   | Malta . . . . . 3.3    | Vienna . . . . . 7.7   |
|                       | Algiers . . . . . 2.9  | Berlin . . . . . 3.8   |
|                       | St. Helena . . . . 2.2 | Rome . . . . . 3.4     |

The major part of the mortality in the Canary Islands is due to diseases of the lungs and bowels occurring in infants, as in all countries, in a great measure due to want of care, food, clothing, &c. In times of epidemics the mortality is considerably augmented from no attempt at isolation nor preventive measures being taken.

Vaccination is practised, but is not compulsory. Cases of leprosy are found, chiefly in the remoter islands, and it is said to affect certain districts more than others. According to Hirsch the first leper house was opened in 1542, but I think the numbers are diminishing as very few are seen. The authorities hold that it is non-contagious, and from inquiries I cannot trace any connection between it and a salt-fish diet. I have noticed in many cases that the exposed parts, such as the hands and face, are more usually attacked. The disease appears to commence in these parts and then spreads to other regions. By law all lepers should be segregated.

There are no diseases peculiar to the islands as at Gibraltar, Malta, and other places on the Mediterranean littoral, nor is there any malaria. Visitors may hear of *calientura* or *andancia* and think these are something peculiar; the first is simply any slight feverish condition, the second any illness

that may be prevalent. A great deal may be heard about diarrhoeal attacks, sometimes, but wrongly, called *Canary fever*, and the origin of them may be assigned to any number of causes. They may be due to bad hygienic conditions, when visitors have the remedy in their own hands. In all warm climates a chill may produce colic and diarrhoea, and for this there is nothing better than the wearing of the old-fashioned cholera belt; another precaution on arriving is to take some gentle aperient, as castor oil; for the first few days to be moderate in eating fruit and vegetables, and to avoid continuous exposure to the sun.

*Drainage.*—It may be stated with perfect truthfulness that there is no system of drainage in the islands. I hope that without being thought to be a Goth I may express the wish that no modern system will ever be undertaken. In a warm climate, with a limited supply of fresh water, the modern system of drainage is the most dangerous that can be devised for this combination of circumstances. The dry-earth system gives the safest results. In the case of Las Palmas, except with a heavy outlay, it would be impossible to devise any workable system. Part of the town is perfectly level, not much above the sea level. The other part is perched on the face of cliffs and the limited supply of fresh water would also make any system still more difficult. The volume of sewage is small compared with that of an English town of the same size, as the inhabitants do not use much water for domestic purposes.

The rainfall being small, there is not much storm water, which in the smaller towns simply flows to the sides of the street, but in the main streets of the larger towns it is carried away by covered sewers that run under the pavements, but into these only the storm water from the streets can enter.

For house purposes in the larger towns the cesspool system is the one in vogue. In many houses there are two deposits, one for the storm, the other for slop water. The soil is so porous that the water usually disappears by filtration.

The cesspool proper, from being used with little water and the soil being porous, may go on for years without being

cleaned. In the country districts it is entirely absent or of the most primitive character.

*Water supply.*—The water for the towns is supplied from perpetual springs, and conducted in water-courses made of stone and cement.

One class of water-courses is used entirely for purposes of the irrigation of the estates through which the water-course passes; by this means tracts of land are cultivated that otherwise would be barren for seven or eight months of the year. In winter time, when water is plentiful, this water has no market value, but during the summer, especially on the eastern parts of Teneriffe and Grand Canary, near the coast, as much as eight shillings an hour may be paid for it irrespective of the size of the stream, which dwindles as the dry season advances. The price of any estate is always estimated by the amount of irrigation necessary and the quantity of proprietary water; this is usually reckoned at so many hours every fifteen days, but it is no uncommon thing for the water to be bought and sold independent of any estate, and the laws concerning it are more complicated than the land laws. The water-courses for this class of water are usually uncovered, the inhabitants having the right to wash clothes in them.

The supply of water for domestic purposes in the larger towns is conducted in stone and cement water-courses, covered over by slabs of stone (in Las Palmas this is being replaced by iron piping); within the town there are two ways of service: one (the most common) is that the occupiers go to the public stands for all their water; in other cases it may be laid on in pipes to the house, either with a constant service, or else it is stored in a tank which is filled as occasion requires. The water supply, both for Las Palmas and Oratava, is pure and abundant, even in dry seasons. That for Santa Cruz is scanty, though steps are being taken to augment the supply. Strictly speaking, the water for all these places is pure, as the fountains are pure. The danger, if any, will be in the distribution within the houses. In the country districts and villages, where the population is more sparse and the springs are at some distance, there is usually only one supply of water for irrigation, washing clothes, and domestic purposes;

no washing is allowed before eight o'clock in the morning, when the inhabitants in the vicinity are supposed to have obtained their day's supply of water. If the spring is near the village, which is often the case, the water for domestic purposes is drawn from a higher part, nearer the spring, and all the washing is done below.



## SECTION VII.

### NATURAL MINERAL WATERS.

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ZABINOSA, CHARCO VERDE, SANTA CATALINA, FIRGAS, AGAETE.

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*Natural Mineral Waters.*—In the Canary Islands there are several springs of mineralised waters. With one exception they are all found at the surface of the ground, in the bottom of ravines (*barrancos*), far away from the centres of population.

There are three springs, found in different islands, that have chloride of sodium as their main constituent. These are, Zabinosa in the island of Hierro, Charco Verde in La Palma, and Santa Catalina in the island of Grand Canary. An analysis of the Zabinosa water, made in Liverpool, gives the following result :

|                    |   |   |                              |
|--------------------|---|---|------------------------------|
| Chloride of soda   | . | . | 340·55 grains to the gallon. |
| „ of potash        | . | . | ·87 „ „                      |
| Carbonate of lime  | . | . | 20·82 „ „                    |
| „ of magnesia      | . | . | 57·47 „ „                    |
| „ of soda          | . | . | Nil                          |
| Sulphate of potash | . | . | 8·22 „ „                     |
| „ of magnesia      | . | . | 33·04 „ „                    |
| „ of soda          | . | . | 14·45 „ „                    |
| Sulphide of soda   | . | . | ·27 „ „                      |
| Silica alumina     | . | . | 1·25 „ „                     |
| Free ammonia       | . | . | ·028 per million.            |
| Albumenoid ammonia | . | . | ·012 „                       |

An analysis of the Charco Verde water from the island of La Palma, made for me by the same firm, is as follows :

|                    |   |   |                              |
|--------------------|---|---|------------------------------|
| Chloride of sodium | . | . | 176·08 grains to the gallon. |
| „ of potash        | . | . | ·25 „ „                      |
| „ of calcium       | . | . | Nil                          |
| „ of magnesium     | . | . | Nil                          |

|                                                              |                            |
|--------------------------------------------------------------|----------------------------|
| Carbonate of lime . . .                                      | 2·47 grains to the gallon. |
| „ of magnesium . . .                                         | 61·23 „ „                  |
| „ of soda . . .                                              | 21·14 „ „                  |
| Sulphate of lime . . .                                       | 3·08 „ „                   |
| „ of magnesium . . .                                         | 26·94 „ „                  |
| „ of soda . . .                                              | 40·41 „ „                  |
| Silica alumina . . .                                         | Nil                        |
| Water of hydration and nitro-<br>genous organic matter . . . | 11·58 „ „                  |

Although these two analyses do not show any sulphur properties, yet at the springs the waters possess a smell and taste of rotten eggs (sulphuretted hydrogen). Even when they reached me in Las Palmas, on their way to England for analysis, in neither of the bottles opened could any smell or taste of sulphuretted hydrogen be detected. To estimate this an analysis at the springs would be necessary. Probably the nitrogenous matter in Charco Verde water is due to the composition of unstable sulphur compounds, and the substance barégine or glairine is in consequence formed, similar to what occurs in the sulphur springs on exposure of the water to light.

The Santa Catalina spring near Las Palmas has also chloride of sodium as its chief constituent, but it has no sulphur properties. An analysis made in Paris by Dr. C. Méhn, gives the following as its composition :

|                                                                     |                              |
|---------------------------------------------------------------------|------------------------------|
| Chloride of soda . . .                                              | 424·11 grains to the gallon. |
| „ of potash . . .                                                   | 7·57 „ „                     |
| „ of calcium . . .                                                  | 29·62 „ „                    |
| Carbonate of lime . . .                                             | 10·31 „ „                    |
| „ of magnesia . . .                                                 | 81·19 „ „                    |
| Sulphate of magnesia . . .                                          | 61·02 „ „                    |
| Silica . . .                                                        | 7·54 „ „                     |
| Free carbonic acid gas, or in a<br>state of loose combination . . . | 70·41 „ „                    |

The temperature of this spring is 80° F., and does not vary during the year, the temperature of the other springs is somewhat higher. The Spaniards use these waters internally, and in the form of baths, only during the warm months (July to September), for it is said that then the waters are the most active. This may be so, but it is the custom to take baths at this time of the year and also during the warm weather. They

feel the benefit of change of air and scene in combination with the slight aperient action of the waters. The number of baths according to local custom is stated to be nine, and if a second series is begun it must be concluded. The bath accommodation is poor and primitive, and the house accommodation in Zabinosa and Charco Verde is practically nil. Instead of entering into the various applications of these waters, I have compared them with other well-known springs of water (see Table, p. 71).

In the island of Grand Canary, between the districts of Teror and Agaete, there is a tract of country the main features of which are deep ravines (*barrancos*) running from the coast to the centre of the island and separated from each other by high mountainous ridges. The geological formation is essentially basaltic, but underneath there must be deposits of magnesium limestone, which in some places is evidently associated with iron.

In the ravines are found various mineral waters, all surcharged with carbonic acid gas, of which the following are the best known. The mineral spring near Teror (*Agua de Teror*) gives a plentiful supply. There are baths adjoining. It is in its character similar to the water of Firgas, but is weaker in mineral constituents and in carbonic acid gas. It is much used as a table water, but has not been analysed.

In the next ravine, separated by a mountainous ridge, in the district of Firgas (1500 feet above sea level), there are two springs of mineral water.

The first, usually called Firgas Water (*Agua Agria*), issues in a small flow from a natural fissure in the basaltic strata of the mountain side. The road from the village of Firgas is extremely picturesque, but very rough; the last part of the journey is accomplished on foot.

From its analysis it may be classed with the earthy or calcareous group of waters.

| Chemical constituents. | Woodhall Spa. | Homburg.        | Kreuznach. | Wiesbaden.           | Helonan.        | Santa Catalina. | Charco Verde.   | Zabinosa.       | Aix la Chapelle.                         | Barège. | Bonne.          | Helonan.              |
|------------------------|---------------|-----------------|------------|----------------------|-----------------|-----------------|-----------------|-----------------|------------------------------------------|---------|-----------------|-----------------------|
|                        |               |                 |            |                      |                 |                 |                 |                 |                                          |         |                 | Grains to the gallon. |
| Chloride of soda .     | 1330.0        | 791.5           | 723.8      | 524.9                | 277.7           | 424.1           | 176.0           | 340.32          | 207.7                                    | 3.07    | 17.5            | 226.6                 |
| of potash .            | ...           | ...             | ...        | ...                  | ...             | ...             | .25             | .87             | ...                                      | ...     | 2.4             | ...                   |
| of calcium .           | 111.0         | ...             | 138.8      | 37.17                | 11.3            | 29.6            | ...             | ...             | ...                                      | ...     | ...             | 12.1                  |
| of magnesia .          | 91.0          | 77.9            | 40.7       | 15.66                | 219.7           | ...             | ...             | ...             | ...                                      | ...     | ...             | 124.8                 |
| Carbonate of lime .    | ...           | 109.9           | 16.9       | 32.10                | 87.2            | 10.3            | 2.47            | 20.8            | 12.17                                    | .22     | ...             | 55.5                  |
| of magnesia .          | ...           | 20.1            | 1.06       | ...                  | ...             | 81.1            | 61.2            | 57.4            | 3.9                                      | .26     | ...             | ...                   |
| of soda .              | ...           | ...             | ...        | ...                  | ...             | ...             | 21.1            | ...             | 49.9                                     | .39     | ...             | ...                   |
| of iron .              | ...           | 4.6             | 1.50       | .43                  | ...             | ...             | ...             | ...             | .7                                       | ...     | ...             | ...                   |
| Sulphate of soda .     | ...           | ...             | ...        | ...                  | 49.8            | ...             | 40.4            | 14.45           | 21.7                                     | 3.8     | 2.8             | ...                   |
| of potash .            | ...           | ...             | ...        | ...                  | ...             | ...             | ...             | 8.24            | 11.8                                     | ...     | ...             | ...                   |
| of magnesia .          | ...           | ...             | ...        | ...                  | 76.1            | 61.0            | 3.08            | 33.0            | ...                                      | ...     | ...             | 9.4                   |
| of lime .              | ...           | ...             | ...        | ...                  | 1.48            | ...             | ...             | ...             | ...                                      | ...     | 11.1            | ...                   |
| Sulphide of soda .     | ...           | ...             | ...        | ...                  | ...             | ...             | ...             | .273            | .73                                      | .36     | ...             | ...                   |
| Silica .               | ...           | ...             | ...        | ...                  | .88             | ...             | ...             | .875            | 5.0                                      | 5.1     | 6.3             | ...                   |
| Alumina .              | ...           | ...             | ...        | ...                  | 30.2            | 7.54            | Traces          | ...             | 5.7                                      | ...     | 1.0             | ...                   |
| Organic matter .       | ...           | ...             | ...        | ...                  | 2.33            | ...             | 11.58           | ...             | ...                                      | ...     | ...             | ...                   |
| Gases .                | ...           | CO <sub>2</sub> | ...        | CO <sub>2</sub><br>N | CO <sub>2</sub> | CO <sub>2</sub> | SN <sub>2</sub> | SH <sub>2</sub> | CO <sub>2</sub><br>N.<br>SH <sub>2</sub> | ...     | SH <sub>2</sub> | SH <sub>2</sub>       |



*Analysis of Firgas Water.*

|                         |                            |
|-------------------------|----------------------------|
| Carbonate of lime . . . | 12·6 grains to the gallon. |
| „ of magnesia . . .     | 11·7 „ „                   |
| „ of soda . . .         | 1·5 „ „                    |
| Chloride of soda . . .  | 5·0 „ „                    |
| Sulphate of soda . . .  | 1·2 „ „                    |

*Gases.*

|                              |           |
|------------------------------|-----------|
| Free carbonic acid gas . . . | 110·0 „ „ |
|------------------------------|-----------|

The following indicates the extreme purity.

|                          |                   |
|--------------------------|-------------------|
| Free ammonia . . .       | 0·28 per million. |
| Albumenoid ammonia . . . | ·02 „             |

From the relative amounts of these two latter constituents the spring must issue from a great depth.

The importance of this spring and also that of Teror lies in their extensive use as table waters. The taste is agreeable, piquant; they blend with red wine or spirits, and in moderate quantities they possess no lowering action. If proper attention was paid to the bottling they would be highly charged with carbonic acid gas, but at present eight-tenths is lost. In the case of the Firgas water there are no baths, as the amount of water is small and the vicinity is practically inaccessible.

These waters resemble many others on the Continent and in America. For purposes of comparison a few analyses of the most important of this class are given.

| Constituents.           | Firgas.                | Bethseda,<br>U.S. | Contréx-<br>ville.     | St. Garnier.<br>Noël. | Wildungen.             |
|-------------------------|------------------------|-------------------|------------------------|-----------------------|------------------------|
| Carbonate of lime . . . | 12·6                   | 20·4              | 28·0                   | 46·9                  | 49·8                   |
| „ of magnesia . . .     | 11·7                   | 14·8              | 2·4                    | 25·5                  | 37·4                   |
| „ of soda . . .         | 1·5                    | 1·5               | ...                    | 21·0                  | 4·4                    |
| Chloride of soda . . .  | 5·0                    | 1·3               | ·38                    | 4·6                   | ·49                    |
| Sulphate of soda . . .  | 1·2                    | ·5                | 16·5                   | 8·4                   | 4·7                    |
| „ of lime . . .         | ...                    | ...               | 81·5                   | 4·9                   |                        |
| „ of magnesia . . .     | ...                    | ...               | 2·1                    |                       |                        |
| <i>Gases</i> . . .      | CO <sub>2</sub><br>110 |                   | CO <sub>2</sub><br>5·6 | CO <sub>2</sub>       | CO <sub>2</sub><br>175 |

Grains  
to the  
gallon.

The indications for medicinal use are naturally similar; being a good diuretic they promote the elimination of uric acid, and consequently are indicated where this is at fault. They are not a solvent for calculi, but in other nephritic and cystic diseases, especially when associated with a scanty, highly-concentrated secretion of acid urine, these waters will be found of the utmost benefit.

In cases where there are acute gastric or intestinal symptoms they are contra-indicated.

Much nearer the village of Firgas, but 800 feet lower, a spring issues out of the bottom of the ravine called *Fuente Santa*. The temperature of this is about 82° F., the flow moderate, as it takes about seven minutes to fill an ordinary bath. The water belongs to a rich Spanish gentleman, who unfortunately has not had it analysed. It is, however, very similar to the water of Agaete, containing iron in the form of ferrous carbonate, carbonates of lime and magnesium, but not being highly charged with carbonic acid gas it is not so strong in mineral constituents. The bath accommodation is primitive; a course of baths is usually seven or nine and the length of immersion from fifteen to twenty minutes.

The whole district is picturesque in the extreme, and the *fonda* at Firgas, though primitive, is clean. The actual distance, as the crow flies, from this place to the district of Agaete is not great, though by the road eight or ten hours' journey would be necessary. In the head of the Valley of Agaete is found another spring of the same class as *Fuente Santa*.

From an analysis the main and important constituent is iron in one of its most easily assimilated forms.

#### *Analysis of Water Agaete.*

|                         |                            |
|-------------------------|----------------------------|
| Ferrous carbonate . . . | 10·0 grains to the gallon. |
| Carbonate of lime . . . | 3·0   "   "                |
| " of magnesia . . .     | 33·5   "   "               |
| Sulphate of soda . . .  | 2·5   "   "                |
| Chloride of soda . . .  | 4·5   "   "                |
| Silica . . . . .        | 8·8   "   "                |

The carbonic acid gas was not estimated, as owing to bad corking it had escaped; even if well bottled it is difficult to

keep these two iron waters for any great length of time, as the iron is readily deposited. The indications for the use of this water are obvious, as it is a type of many other well known iron springs. I have compared its constituents in the following table :

| Constituents.         | Agæte. | Pymont. | Orezza. | San Moritz. | Spa. | Schwalbach. |                         |
|-----------------------|--------|---------|---------|-------------|------|-------------|-------------------------|
| Ferrous carbonate .   | 10·0   | 5·7     | 8·9     | 3·7         | 3·7  | 5·1         | } Grains to the gallon. |
| Carbonate of magnesia | 33·5   | 1·7     | 5·1     | 16·8        | 11·2 | 13·0        |                         |
| Sulphate of soda .    | 2·5    | ...     | ...     | 24·3        | ·3   | ·4          |                         |
| Carbonate of lime .   | 3·0    | 104·7   | 42·1    | 89·8        | 9·8  | 13·6        |                         |
| Chloride of soda .    | 4·5    | 5·1     | ...     | 2·8         | 4·5  | ·4          |                         |

Both waters can be used ; the taste is agreeable, though chalybeate. Arrangements can be made to have frequent and constant supplies brought to any of the hotels. Though it is the custom for the Spaniards to take the baths during July and August only, yet I am informed that the waters are the same all the year round, and therefore there is no reason if proper bathing and hotel accommodation were provided why they should not be available during the whole year.

In the district of Aguimes, towards the south of Grand Canary, there was another natural spring said to contain arsenic, but the inhabitants blocked the exit so effectually, because of the illness of a boy who had drunk freely of it, that the spring has found some other unknown vent. In the district of Vila Flor, in the south of Teneriffe, at a height of five thousand feet, there is a spring called Agua Agria. There is no analysis of it, but it is probably of the same nature as the Fargas water.

## SECTION VIII.

### COMPARISON WITH OTHER HEALTH RESORTS BY MEANS OF METEOROLOGICAL DATA.

*Comparison with other health resorts.*—The only methods of comparing the climate of one place with that of another, are either by the flora or else by the meteorological data. The former is out of the question on any large scale, and the latter is open to many objections, but as it gives the most information this method has been chosen, and data for various places have been collected and arranged according to the locality of the resort, (1) on the littoral of the Atlantic Ocean, (2) on the Mediterranean littoral, (3) inland, and (4) miscellaneous.



*Mean Shade Temperatures. Degrees Fahr.*

|            | Latitude. | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |      |
|------------|-----------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|------|
| Ventnor    | 50° 40"   | 43.6 | 41.9 | 43.1   | 47.4   | 53.3 | 58.3  | 61.2  | 61.8 | 59.1  | 52.1 | 47.8 | 42.3 | 20.2 |
| Torquay    | 50 30     | 41.6 | 41.6 | 42.5   | 46.3   | 52.1 | 57.7  | 60.4  | 60.1 | 56.9  | 50.5 | 46.6 | 41.8 | 18.8 |
| Falmouth   | 50 30     | 43.6 | 44.1 | 44.2   | 47.2   | 51.7 | 57.2  | 60.1  | 60.3 | 56.8  | 51.8 | 47.5 | 44.3 | 16.7 |
| Guernsey   | 49 30     | 43.4 | 43.2 | 44.6   | 47.9   | 53.4 | 57.6  | 60.8  | 61.4 | 59.4  | 53.0 | 49.3 | 44.2 | 18.2 |
| Biarritz   | 43 0      | 44.2 | 43.9 | 54.8   | 54.3   | 60.1 | 68.5  | 69.8  | ...  | ...   | ...  | 50.2 | 46.1 | 20.0 |
| Lisbon     | 38 0      | 50.8 | 52.9 | 54.1   | 59.0   | 62.0 | 71.7  | 75.0  | 70.5 | 68.0  | 62.4 | 56.4 | 51.7 | 20.0 |
| Gibraltar  | 36 6      | 55.0 | 55.3 | 56.3   | 61.0   | 65.9 | 71.7  | 75.0  | 74.7 | 71.0  | 64.5 | 60.2 | 55.7 | 20.0 |
| Tangiers   | 35 47     | 51.0 | 50.0 | 52.1   | 55.2   | 58.5 | 63.4  | 65.6  | 66.3 | 65.5  | 60.8 | 56.0 | 48.9 | 15.4 |
| Mogador    | 31 3      | 61.2 | 61.5 | ...    | ...    | ...  | 70.8  | 71.1  | 71.2 | ...   | ...  | ...  | 61.4 | 10.1 |
| Madeira    | 32 40     | 64.0 | 61.0 | 60.3   | 62.3   | 64.3 | 67.8  | 70.7  | 72.3 | 71.7  | 68.9 | 65.2 | 61.6 | 12.2 |
| Oratava    | 28 25     | 59.4 | 60.4 | 62.5   | 63.8   | 65.3 | 69.0  | 72.3  | 72.6 | 71.8  | 66.9 | 64.3 | 61.2 | 13.2 |
| Santa Cruz | 28 28     | 63.5 | 62.8 | 64.8   | 66.5   | 69.0 | 73.0  | 76.2  | 76.2 | 76.1  | 73.0 | 68.8 | 65.5 | 13.4 |
| Las Palmas | 28 17     | 62.3 | 63.0 | 63.7   | 64.3   | 66.6 | 69.8  | 72.4  | 74.7 | 73.0  | 71.4 | 67.6 | 64.2 | 12.4 |
| Marseilles | 43 20     | 47.0 | 45.5 | 48.1   | 54.0   | 60.3 | 66.9  | 72.9  | 74.8 | 67.5  | 62.2 | 50.4 | 44.3 | 29.4 |
| Hyères     | 43 0      | 47.3 | 50.5 | 52.5   | 56.0   | ...  | ...   | ...   | ...  | ...   | ...  | 53.6 | 49.0 | 28.8 |
| Nice       | 43 39     | 47.1 | 46.2 | 51.8   | 58.1   | 64.2 | 71.1  | 75.0  | 74.8 | 69.1  | 62.6 | 53.8 | 48.6 | 27.6 |
| Mentone    | 43 45     | 49.9 | 50.0 | 52.5   | 58.0   | 64.2 | ...   | ...   | ...  | ...   | 63.7 | 55.4 | 50.6 | 27.6 |
| San Remo   | 43 48     | 47.2 | 50.1 | 52.0   | 57.0   | 62.9 | 69.1  | 74.3  | 73.8 | 70.5  | 61.8 | 53.4 | 49.2 | 27.6 |
| Alassio    | 43 50     | 47.3 | 48.2 | 52.3   | 56.4   | 64.3 | ...   | ...   | ...  | ...   | ...  | 54.3 | 49.7 | 30.5 |
| Genoa      | 44 25     | 45.2 | 47.0 | 51.2   | 55.8   | 64.1 | 71.4  | 75.6  | 75.7 | 69.5  | 62.6 | 55.3 | 48.8 | 27.8 |
| Ajaccio    | 42 0      | 50.4 | 53.1 | 54.5   | 58.3   | 64.6 | 73.2  | 76.8  | 78.2 | 73.6  | 67.0 | 57.5 | 53.1 | 30.3 |
| Valencia   | 39 30     | 50.5 | 51.6 | 55.8   | 61.2   | 66.7 | 74.3  | 79.3  | 80.8 | 73.9  | 66.9 | 58.3 | 50.8 | 26.5 |
| Naples     | 41 50     | 46.4 | 47.5 | 50.2   | 56.5   | 64.0 | 70.5  | 75.2  | 75.0 | 69.0  | 57.6 | 54.0 | 48.7 | 26.0 |
| Palermo    | 38 18     | 51.6 | 52.0 | 54.5   | 58.8   | 65.5 | 72.1  | 76.8  | 77.5 | 73.4  | 66.7 | 59.9 | 54.1 | 24.0 |
| Malta      | 35 53     | 55.9 | 54.7 | 57.3   | 60.3   | 67.0 | 72.3  | 77.7  | 78.8 | 75.5  | 70.2 | 62.6 | 57.8 | 23.2 |
| Algiers    | 36 46     | 56.0 | 55.5 | 57.2   | 61.3   | 65.9 | 72.6  | 75.7  | 78.7 | 74.1  | 68.7 | 61.7 | 56.1 | 20.9 |
| Ramleh     | 31 11     | 58.1 | 58.6 | 61.6   | 66.0   | 70.0 | 75.0  | 77.6  | 79.0 | 77.4  | 74.6 | 68.2 | 62.0 | 20.9 |

*Mean Shade Temperatures (continued). Inland Towns.*

|                                           | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |                                          |  |
|-------------------------------------------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|------------------------------------------|--|
| Pau .                                     | 41.4 | 43.3 | 48.1   | 53.9   | 59.8 | ...   | ...   | ...  | ...   | ...  | 46.7 | 43.0 | } As supplied by Government authorities. |  |
| Florence .                                | 41.4 | 44.0 | 48.2   | 55.0   | 64.2 | 72.3  | 76.6  | 74.9 | 66.9  | 59.4 | 49.9 | 42.5 |                                          |  |
| Rome .                                    | 46.7 | 48.2 | 52.2   | 58.4   | 65.7 | 73.2  | 77.7  | 77.1 | 70.4  | 64.0 | 54.6 | 48.4 |                                          |  |
| Seville .                                 | 52.3 | 56.1 | 56.7   | 65.7   | 69.4 | 78.1  | 83.1  | 83.8 | 79.2  | 68.5 | 60.4 | 51.8 |                                          |  |
| Cairo .                                   | 53.6 | 57.0 | 62.8   | 70.4   | 75.2 | 82.6  | 83.8  | 82.2 | 77.8  | 74.3 | 64.4 | 58.4 |                                          |  |
| Biskra .                                  | 50.9 | 51.5 | 55.0   | 63.4   | 72.3 | 82.0  | 89.7  | 90.2 | 77.9  | 69.5 | 58.1 | 49.5 |                                          |  |
| El Monte .                                | 50.2 | 52.4 | 52.9   | 51.8   | 54.8 | ...   | ...   | ...  | ...   | ...  | 57.8 | 52.5 |                                          |  |
| Wynberg .                                 | 71.0 | 69.8 | 67.7   | 62.7   | 59.3 | 55.9  | 55.3  | 56.0 | 57.9  | 60.7 | 64.0 | 69.0 |                                          |  |
| Durban .                                  | 75.3 | 72.7 | 74.0   | 70.0   | 67.5 | 63.1  | 61.7  | 64.2 | 64.8  | 66.8 | 70.8 | 74.2 |                                          |  |
| Bermudas .                                | 63.3 | 64.6 | 63.1   | 64.8   | 73.0 | 74.5  | 78.3  | 79.6 | 77.3  | 72.5 | 68.0 | 63.8 | }                                        |  |
| Bahamas .                                 | 70.0 | 72.0 | 72.3   | 74.7   | 77.6 | 80.0  | 83.3  | 83.7 | 81.9  | 78.8 | 74.4 | 72.8 |                                          |  |
| Barbadoes .                               | 73.6 | 73.4 | 73.5   | 76.2   | 76.2 | 76.9  | 76.7  | 76.7 | 76.7  | 76.9 | 76.1 | 75.0 |                                          |  |
| <i>Mean Minimum Temperature in Shade.</i> |      |      |        |        |      |       |       |      |       |      |      |      |                                          |  |
| Ventnor .                                 | 37.4 | 37.7 | 37.6   | 41.2   | 47.1 | 51.8  | 55.3  | 55.8 | 53.7  | 47.0 | 43.7 | 38.2 |                                          |  |
| Torquay .                                 | 37.2 | 36.9 | 36.6   | 40.0   | 45.4 | 50.6  | 53.3  | 52.9 | 50.5  | 44.5 | 41.9 | 37.1 |                                          |  |
| Falmouth .                                | 39.8 | 39.1 | 39.1   | 41.9   | 46.8 | 51.8  | 54.4  | 54.5 | 52.4  | 47.2 | 44.5 | 39.8 |                                          |  |
| Guernsey .                                | 39.7 | 39.9 | 40.1   | 43.2   | 47.7 | 51.9  | 55.1  | 55.8 | 54.4  | 48.7 | 45.7 | 40.7 |                                          |  |
| Hyères .                                  | 39.5 | 42.8 | 43.4   | 47.6   | ...  | ...   | ...   | ...  | ...   | ...  | 45.4 | 40.1 |                                          |  |
| San Remo .                                | 41.2 | 47.1 | 48.8   | 53.5   | ...  | ...   | ...   | ...  | ...   | ...  | 47.6 | 40.4 |                                          |  |
| Ramleh .                                  | 53.2 | 54.0 | 56.0   | 60.6   | 65.6 | 71.2  | 74.8  | 76.1 | 74.6  | 70.6 | 64.0 | 57.0 |                                          |  |
| Cairo .                                   | 46.6 | 48.8 | 53.0   | 59.9   | 63.4 | 70.2  | 72.2  | 71.4 | 68.0  | 64.8 | 56.3 | 50.4 |                                          |  |
| Tangiers .                                | 50.1 | 50.0 | 52.1   | 55.2   | 58.5 | 61.3  | ...   | ...  | 65.0  | 60.8 | 56.0 | 49.0 |                                          |  |
| Madeira .                                 | 55.4 | 55.2 | 55.5   | 57.6   | 59.7 | 63.6  | 66.4  | 67.6 | 67.0  | 64.0 | 60.4 | 56.9 |                                          |  |
| Oratava .                                 | 53.1 | 54.5 | 54.6   | 57.2   | 58.2 | 61.9  | 65.6  | 66.4 | 65.1  | 63.5 | 58.2 | 55.1 |                                          |  |
| Santa Cruz .                              | 59.0 | 56.5 | 59.2   | 60.2   | 64.2 | 65.0  | 67.5  | 67.5 | 68.4  | 64.6 | 60.6 | 56.6 |                                          |  |
| Las Palmas .                              | 57.8 | 57.9 | 58.9   | 60.0   | 62.9 | 66.1  | 68.8  | 70.2 | 68.4  | 66.8 | 63.2 | 59.7 |                                          |  |
| El Monte .                                | 50.2 | 52.4 | 52.9   | 51.8   | 54.8 | ...   | ...   | ...  | ...   | ...  | 57.8 | 52.5 |                                          |  |

Mean Range of Temperature in Shade (daily).

|            | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|------------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|--------|
| Torquay    | 8.8  | 9.3  | 11.7   | 12.7   | 13.4 | 14.4  | 14.1  | 14.3 | 12.8  | 9.9  | 9.5  | 8.3  |        |
| Ventnor    | 8.3  | 8.4  | 11.0   | 12.2   | 12.5 | 13.9  | 11.7  | 12.1 | 11.9  | 10.2 | 8.2  | 8.0  |        |
| Falmouth   | 6.6  | 6.4  | 7.4    | 8.7    | 10.7 | 10.3  | 10.3  | 9.6  | 8.4   | 7.6  | 6.9  | 6.6  |        |
| Guernsey   | 7.3  | 6.7  | 8.8    | 9.6    | 11.4 | 11.3  | 9.4   | 11.3 | 10.0  | 8.6  | 7.1  | 7.0  |        |
| Lisbon     | 9.5  | 11.3 | 12.1   | 13.1   | 13.9 | 14.9  | 16.2  | 16.4 | 14.0  | 11.9 | 10.9 | 9.5  |        |
| Gibraltar  | 10.8 | 12.8 | 15.4   | 13.0   | 13.2 | 16.4  | 17.5  | 19.5 | 17.0  | 14.9 | 11.8 | 10.8 |        |
| Tangiers   | 5.3  | 7.8  | 7.2    | 7.9    | 7.7  | 8.9   | 8.3   | 7.6  | 8.5   | 7.2  | 5.6  | 6.2  |        |
| San Remo   | 6.3  | 5.8  | 6.4    | 4.4    | ...  | ...   | ...   | ...  | ...   | ...  | 5.3  | 6.9  |        |
| Hyères     | 15.5 | 15.4 | 17.1   | 17.0   | ...  | ...   | ...   | ...  | ...   | ...  | 16.3 | 14.7 |        |
| Ramleh     | 9.8  | 10.2 | 12.0   | 12.4   | 9.8  | 8.4   | 6.4   | 6.3  | 6.9   | 8.6  | 9.4  | 10.8 |        |
| Cairo      | 14.8 | 16.5 | 20.2   | 21.2   | 23.4 | 24.5  | 20.8  | 21.5 | 19.5  | 18.2 | 17.9 | 17.3 |        |
| Oratava    | 12.7 | 11.9 | 14.6   | 15.5   | 13.6 | 14.3  | 13.5  | 12.5 | 13.3  | 13.2 | 12.3 | 12.2 |        |
| Santa Cruz | 10.0 | 11.4 | 10.6   | 10.0   | 11.3 | 14.0  | 15.3  | 15.3 | 12.6  | 13.8 | 13.6 | 14.4 |        |
| Las Palmas | 9.0  | 10.2 | 9.4    | 9.0    | 7.7  | 7.5   | 7.2   | 9.0  | 9.3   | 9.1  | 8.7  | 9.1  |        |

Average Number of Rainy Days (Days on which Rain fell).

|            |    |    |    |    |     |     |     |     |     |     |    |    |     |
|------------|----|----|----|----|-----|-----|-----|-----|-----|-----|----|----|-----|
| Torquay    | 17 | 14 | 16 | 14 | 13  | 13  | 16  | 14  | 15  | 18  | 21 | 18 | 189 |
| Ventnor    | 16 | 13 | 13 | 12 | 12  | 10  | 14  | 13  | 13  | 15  | 18 | 15 | 164 |
| Falmouth   | 21 | 15 | 17 | 14 | 14  | 12  | 17  | 15  | 16  | 20  | 22 | 21 | 204 |
| Guernsey   | 17 | 16 | 14 | 13 | 11  | 10  | 13  | 12  | 14  | 19  | 22 | 18 | 176 |
| Tangiers   | 10 | 12 | 15 | 14 | 10  | 2   | 0   | 0   | 3   | 11  | 7  | 14 | 100 |
| Hyères     | 7  | 8  | 5  | 8  | ... | ... | ... | ... | ... | ... | 4  | 4  | 63  |
| San Remo   | 5  | 4  | 4  | 7  | ... | ... | ... | ... | ... | ... | 6  | 4  | 48  |
| Allassio   | 4  | 5  | 7  | 11 | 6   | 0   | ... | ... | ... | 7   | 9  | 5  | 85? |
| Oratava    | 14 | 10 | 8  | 7  | 8   | 0   | 3   | 0   | 2   | 17  | 8  | 17 | 60  |
| Las Palmas | 10 | 5  | 7  | 4  | 3   | 1   | 0   | 0   | 1   | 6   | 11 | 12 | 170 |
| Bermudas   | 15 | 13 | 17 | 12 | 12  | 14  | 14  | 14  | 12  | 15  | 17 | 13 | 108 |
| Bahamas    | 2  | 9  | 5  | 6  | 8   | 10  | 10  | 14  | 15  | 12  | 7  | 13 | 108 |





*Amount of Cloud 0—10. 10 = overcast.*

|                      | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Average. |
|----------------------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|----------|
| Ventnor . . . . .    | 6.8  | 6.6  | 5.9    | 5.8    | 5.5  | 5.7   | 6.1   | 5.4  | 5.8   | 6.0  | 6.7  | 6.7  | 6.1      |
| Torquay . . . . .    | 7.9  | 7.8  | 6.7    | 7.0    | 6.7  | 6.4   | 6.6   | 6.3  | 6.5   | 6.9  | 7.3  | 7.4  | 7.0      |
| Falmouth . . . . .   | 7.9  | 7.2  | 6.8    | 6.8    | 6.3  | 6.4   | 6.9   | 6.6  | 6.7   | 6.9  | 7.2  | 7.2  | 6.9      |
| Guernsey . . . . .   | 7.3  | 7.3  | 6.6    | 6.3    | 5.7  | 6.0   | 6.2   | 6.5  | 6.3   | 6.6  | 7.7  | 7.7  | 6.6      |
| Cairo . . . . .      | 4.1  | 4.2  | 3.4    | 3.4    | 2.3  | 1.0   | 1.2   | 1.6  | 1.8   | 2.5  | 3.0  | 3.7  | 2.6      |
| Ramleh . . . . .     | 4    | 4    | 3      | 2      | 2    | 1     | 1     | 1    | 2     | 2    | 3    | 4    | 2.4      |
| Las Palmas . . . . . | 4.9  | 4.3  | 4.9    | 5.2    | 4.9  | 5.5   | 5.8   | 5.5  | 4.6   | 4.7  | 4.8  | 5.0  | 4.7      |

*Average Sunshine Recorded (in hours).*

|                          | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Total. |
|--------------------------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|--------|
| Kew . . . . .            | 26   | 54   | 73     | 68     | 158  | 185   | 182   | 151  | 153   | 82   | 46   | 34   | 1204   |
| Southbourne . . . . .    | 49   | 71   | 116    | 147    | 213  | 200   | 204   | 200  | 131   | 107  | 60   | 49   | 1547   |
| Bexhill-on-Sea . . . . . | 64   | 77   | 116    | 152    | 242  | 292   | 249   | 245  | 230   | 139  | 84   | 86   | 1979   |
| Ventnor . . . . .        | 66   | 63   | 97     | 115    | 179  | 203   | 229   | 167  | 171   | 119  | 49   | 38   | 1501   |
| Falmouth . . . . .       | 46   | 71   | 131    | 174    | 223  | 238   | 215   | 206  | 145   | 112  | 70   | 57.8 | 1693   |
| Torquay . . . . .        | 65   | 68   | 101    | 165    | ...  | ...   | ...   | ...  | ...   | ...  | 57   | 77   |        |
| Jersey . . . . .         | 68   | 87   | 149    | 187    | 243  | 233   | 230   | 242  | 175   | 124  | 65   | 57   | 1879   |
| San Remo . . . . .       | 177  | 209  | 262    | 268    | ...  | ...   | ...   | ...  | ...   | ...  | 185  | 204  |        |
| Oratava . . . . .        | 164  | 163  | 176    | 149    | 203  | 196   | 183   | 182  | 158   | 162  | 142  | 152  | 2030   |
| Las Palmas . . . . .     | 168  | 181  | 184    | 185    | 216  | 194   | 161   | 190  | 204   | 189  | 165  | 161  | 2198   |

*Humidity. Saturation = 100.*

|                     | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Average. |
|---------------------|------|------|--------|--------|------|-------|-------|------|-------|------|------|------|----------|
| Llandudno . . . . . | 83   | 82   | 79     | 76     | 73   | 75    | 76    | 76   | 79    | 80   | 82   | 83   | 79       |
| Brighton . . . . .  | 87   | 85   | 82     | 74     | 71   | 74    | 77    | 70   | 80    | 80   | 86   | 85   | 81       |
| Ventnor . . . . .   | 88   | 86   | 81     | 79     | 75   | 78    | 79    | 76   | 80    | 80   | 85   | 86   | 81       |
| Torquay . . . . .   | 89   | 86   | 80     | 78     | 76   | 75    | 76    | 75   | 82    | 82   | 87   | 88   | 81       |

|                                                        |   |   |      |      |      |      |      |      |      |      |      |      |      |      |    |
|--------------------------------------------------------|---|---|------|------|------|------|------|------|------|------|------|------|------|------|----|
| Falmouth .                                             | . | . | 88   | 86   | 80   | 78   | 77   | 77   | 79   | 71   | 82   | 82   | 85   | 87   | 82 |
| Guernsey .                                             | . | . | 89   | 88   | 84   | 82   | 83   | 83   | 83   | 82   | 84   | 84   | 86   | 87   | 85 |
| Tangiers .                                             | . | . | 83   | 83   | 80   | 80   | 65   | 65   | 59   | 75   | 76   | 83   | 86   | 89   |    |
| San Remo .                                             | . | . | 71   | 69   | 71   | 69   | ...  | ...  | ...  | ...  | ...  | ...  | 74   | 66   |    |
| Algiers .                                              | . | . | 69   | 68   | 65   | 66   | 65   | 63   | 65   | 66   | 66   | 63   | 60   | 65   | 68 |
| Ramleh .                                               | . | . | 67   | 65   | 65   | 66   | 70   | 72   | 75   | 73   | 69   | 68   | 67   | 67   | 58 |
| Cairo .                                                | . | . | 69   | 66   | 56   | 47   | 48   | 44   | 49   | 55   | 62   | 65   | 67   | 69   |    |
| Madeira .                                              | . | . | 70   | 73   | 73   | 70   | 70.6 | 79   | 78   | 73   | 78   | 74   | 69   | 72   |    |
| Oratava .                                              | . | . | 75   | 73   | 73   | 74   | 75   | 74   | 76   | 79   | 80   | 78   | 80   | 78   |    |
| Las Palmas                                             | . | . | 69   | 68   | 67   | 67   | 67   | 67   | 70   | 65   | 70   | 70   | 69   | 67   |    |
| Cape Town                                              | . | . | 62   | 65   | 68   | 73   | 79   | 80   | 80   | 78   | 74   | 73   | 68   | 64   | 72 |
| Bermudas .                                             | . | . | 77   | 79   | 76   | 75   | 78   | 81   | 79   | 76   | 74   | 75   | 78   | 73   | 77 |
| Bahamas .                                              | . | . | 66   | 70   | 61   | 59   | 64   | 70   | 65   | 66   | 71   | 68   | 69   | 72   | 68 |
| Barbadoes .                                            | . | . | 78   | 77   | 78   | 76   | 77   | 82   | 82   | 82   | 81   | 82   | 84   | 82   |    |
| <i>Average Temperature of the Sea in Degrees Fahr.</i> |   |   |      |      |      |      |      |      |      |      |      |      |      |      |    |
| Frith of Forth                                         | . | . | ...  | 37   |      |      |      |      |      |      |      |      |      |      |    |
| Yarmouth .                                             | . | . | ...  | 39   |      |      |      |      |      |      |      |      |      |      |    |
| Torquay .                                              | . | . | ...  | 46   |      |      |      |      |      |      |      |      |      |      |    |
| Falmouth .                                             | . | . | ...  | 48   |      |      |      |      |      |      |      |      |      |      |    |
| San Remo .                                             | . | . | 55.0 | 54.3 | 55.7 | 58.0 | ...  | ...  | ...  | ...  | ...  | ...  | 61.2 | 57.2 |    |
| Las Palmas                                             | . | . | 65.7 | 65.1 | 65.4 | 65.5 | 66.8 | 69.3 | 71.6 | 73.5 | 73.4 | 72.4 | 70.2 | 67.2 |    |

## APPENDIX.

### THE GUANCHE RACE—MANNERS AND CUSTOMS—CRANIOLOGICAL AND SKELETAL PECULIARITIES.

*The Guanche race.*—As mentioned, there are many direct and indirect allusions by ancient writers to islands possessing an equable, warm climate situated outside the pillars of Hercules, on the edge of the western ocean, the region of the setting sun—geography in those days was rather vague. But it is an interesting fact that when discovered in the middle ages neither Madeira nor the Azores nor the Cape de Verde islands were inhabited, nor were any remains of human habitations found. This is not strange considering their geographical position and the way in which the earlier navigators hugged the shore.

The Canary Islands, on the contrary, were definitely known before the Christian era and were then populated. They may have been the foundation of the myths about Atlas, his daughter Calypso, and the Hesperidum Insulæ. They were probably the basis of the Homeric Islands of the Blessed and the Insulæ Fortunatæ of Pliny and Claudius Ptolemæus, the great geographer; whilst the eastern islands of Lanzarote, with those of Allegranza Graciosa and Lobos and perhaps also Fuerteventura, may be identified with the Insulæ Purpurariæ, for here grew in great luxuriance the purple ochilla weed (one of the Saxifrage tribe) from which was produced a purple dye.

One of the Insulæ Purpurariæ was named 'Autolola,' after the chief tribe of the Gaetuli. These Gaetuli (οἱ Γαιτοῦλοι) were a great nomadic race that inhabited the western coast of Africa contiguous to the Insulæ; they extended from the southern slopes of the Atlas mountains on the north to the river Niger on the south, and to an indefinite extent eastwards, occupying the oases of the desert. They were not Æthiopic (negroid)

but Libyan in race, and are supposed to have been the ancestors of the Berbers and to be of Asiatic origin.

Be this as it may, according to Pliny, Status Sebosus, a Roman navigator, was the first to record the distance of the islands from Europe and to name them (45 B.C.).

The following were the names :

| <i>Derivation.</i> | <i>Ancient name.</i> | <i>Modern name.</i> |
|--------------------|----------------------|---------------------|
| Roman matron       | Junonia Major        | Gomera.             |
| " "                | " Minor              | Hierro.             |
| Cloudy, rainy      | Ombrion o' Pluvialis | La Palma.           |
| Snow               | Nivaria              | Teneriffe.          |
| Dogs               | Canaria              | Grand Canary.       |
| Goats              | Capraria             | Fuerteventura.      |
| Orchilla weed      | Purpurariæ           | Lanzarote.          |

When the Spaniards first made expeditions to the islands they were all inhabited, and the inhabitants, the Guanches, resisted the invaders for about 100 years. Finally in 1500 A. D. the Spaniards completed the conquest and by many writers are supposed to have exterminated the race. This, probably, is an error, as many must have survived who would be absorbed by the invading race. What little is known of the history, customs, and language of these Guanches is gathered from the writings and impressions of navigators. No discoveries have been made of any writings or hieroglyphics, and, therefore, any attempt to peer into their history is surrounded with difficulties. Some tablets of stone that have been discovered are considered to be of Phœnician origin.

The name Guanche was originally used only for the inhabitants of Teneriffe, but now it is applied to the original inhabitants of the whole group.

The colour of their skin was swarthy (*trigueño*); the men were more so than the women. The inhabitants of Teneriffe were fairer, particularly on the north side of the island, where the skin was much fairer, and the hair light coloured. There are, however, traditions of ancient settlements (Dutch ?) in the north of this island of a fair haired, tall race of people; signs of this are said to exist at the present time.

I cannot obtain any data with regard to their height, but the average did not much exceed five feet.



The Guanches were essentially a tribal race; each island had its own tribes, councils, and kings, and in some measure its own customs.

The office of king was usually hereditary, and in default of male issue the daughters might succeed to the throne; the rank of nobility was also hereditary, though each aspirant was judged on his own merits, and if ennobled might be deposed if he was considered unworthy. At the coronation of kings and the opening of assemblies wrestling was the chief amusement; even to this day there are great wrestling matches when the men of one district or island are pitted against those of another.

War was decided upon by the king and council; the arms used were slings, spears, and sharp stones. Some of their flints are to be seen in excellent preservation in the Las Palmas museum. The king and members of the council were distinguished by their carrying shields.

The Guanches were not idolators, but are supposed to have been deists and to have had a sacerdotal class, but their religious rites differed. The feast or holy days were associated with the gathering in of the grain. Property seems to have been held more or less in common and the produce divided. In abundant years the excess was handed over to the "Faican," who stored it in caves for the years of scarcity. The ground was worked by means of a pick or hoe made of goat's horn fastened to a handle made of wood. The chief crops were barley, Indian corn, &c., which were afterwards ground to a coarse flour by means of a stone pestle and mortar.

Their habitations were caves excavated in the hillsides or else formed out of natural caves. Houses built of stone appear to have been unknown, as there have not been discovered any traces of stonework.

Their clothes were made from skins of goats and of a kind of matting made from reeds and palm leaves. In some islands (the eastern) very little clothing was worn, especially by the men. The hair of the goat was not put to any use.

They were a monogamous race,—offences against chastity and concubinage were severely punished, sometimes with

death ; the commonest forms of execution were to be buried alive, drawn asunder, or crushed by a heavy weight. The institution of divorce was practised and the guilty one punished. The woman appears to have had some choice in the future husband, and to have rested for thirty days prior to marriage.

The Guanches appear to have had no knowledge of metals nor any articles made from them ; such things as fish-hooks were made from bone or goat's horn. Fish were also killed by spearing them.

Various kinds of pottery have been found. The best specimens are from Teneriffe. They are ornamented by diverse markings, usually in the form of parallel lines, but without any inscription or hieroglyphics. They are often considered to resemble Etruscan ware in form and markings.

Attempts to trace the race by means of its language have not led to much result. All the information is from the earlier explorers, who naturally spelt the words of the Guanche language and dialects according as their ears caught the sound, and according to their own particular language and dialect. The language of each island appears to have differed in some degree, although it must have had a common root. The latest investigators, the Marquis of Bute and Mr. Grey de Birch of the British Museum, were struck with the Aryan elements of the Teneriffe language, and they state that the theory of the Teutonic origin of the Guanche language has been widely discussed and maintained. Another theory is that it was somewhat similar to that of the Moors of Barbary (the Berber theory).

The historian Glas maintained that the language of Teneriffe differed from the other islands, having more affinities to an American than an African source. Specimens of this particular language were lately submitted to the authorities at the British Museum, and were pronounced by them, not knowing its source, to be allied to the original American languages. This shows how various are the ideas on this subject. It is beyond the scope of this work to enter further on this question, as it appears at present to be more or less one of speculation.

Of much more interest and of more value is the method of their disposal of the dead, as it has allowed a large number of osteological specimens to be preserved. Two methods were practised, burial in cairns and embalming. The first method was the commonest; the bed of a stream of lava was chosen and an oblong space was cleared and lined with flat stones. In this the body was laid irrespective of any fixed position, and over it were placed large masses of lava in the form of an arch on which was piled a cairn.

The embalming was very roughly done, the incisions made with a piece of flint, and the balsam used was dragon's blood—a resin exuded from the dragon tree belonging to the order of Liliaceæ. The body was probably sun-dried and then sewn up in goat skins. The needles used were sharpened pieces of bone and the thread was strips of skin. The mummy case was placed in a cave, and families appear to have had their own sepulchres, as caves have been found in which were numbers of mummies regularly arranged and all enveloped in an equal number of skins. In no case have writings or articles been entombed with them, nor have any mummies been found in Lanzarote or Fuerteventura.

A large number of osteological specimens have thus been obtained which have been carefully examined by Dr. Gregorio Chil y Naranjo, and his results are published in his work entitled '*Los Estudios Historicos de las Islas Canarias.*' For the following quotations I am entirely indebted to this work, which is not sufficiently appreciated and known. To his enlightened labours also is due the unrivalled collection of Guanche remains and antiquities in the Museo Canario of Las Palmas.

"In the skull the most distinctive feature is in the lambdoidal region (*trapezio de Welcher*), and is caused by the development of the parietal eminences forming a sufficiently noticeable development that commences two centimetres in front of the obelion and terminates in the lambdoidal suture; this causes an apparent depression of the tabular portion of the occipital bone, a depression more evident when there exists Wormian bones."

"The ridges in the frontal and occipital regions are rugose

and prominent, especially the external occipital protuberance. The frontal suture is frequently manifest, particularly in the lower part; there is nothing distinctive in the coronal and in the sagittal suture out of fifty crania belonging to Grand Canary. The parietal foramina were noted in twenty-two skulls as being well developed, in twelve fairly well, and in sixteen they were absent."

The measurements of the skulls are recorded in centimetres, and are classified according to the islands. From these measurements have been calculated the various indices, which are as follows :

*The cephalic or breadth indices.*

| No. of skulls. |         |        | Island.      | Indices. |          |
|----------------|---------|--------|--------------|----------|----------|
| Male.          | Female. |        |              | Male.    | Female.  |
| 32             | ... 18  | ...    | Grand Canary | ... 73·3 | ... 72·0 |
| 29             | ... 20  | ...    | Teneriffe    | ... 78·2 | ... 78·0 |
| 30             | ... 20  | ...    | Gomera       | ... 77·3 | ... 77·3 |
| 8              | ... 11  | ...    | Hierro       | ... 76·2 | ... 77·2 |
| <hr/>          |         |        |              |          |          |
| Total          | . 99    | ... 69 | Averaged     | . 76·2   | ... 76·1 |

*The height indices.*

| No. of skulls. |         |        | Island.      | Indices. |          |
|----------------|---------|--------|--------------|----------|----------|
| Male.          | Female. |        |              | Male.    | Female.  |
| 32             | ... 18  | ...    | Grand Canary | ... 73·3 | ... 73·1 |
| 29             | ... 20  | ...    | Teneriffe    | ... 71·3 | ... 70·6 |
| 30             | ... 20  | ...    | Gomera       | ... 73·0 | ... 72·7 |
| 8              | ... 11  | ...    | Hierro       | ... 71·0 | ... 70·3 |
| <hr/>          |         |        |              |          |          |
| Total          | . 99    | ... 69 | Averaged     | . 72·6   | ... 71·7 |

*The nasal indices.*

| No. of skulls. |         |        | Island.      | Indices. |          |
|----------------|---------|--------|--------------|----------|----------|
| Male.          | Female. |        |              | Male.    | Female.  |
| 32             | ... 18  | ...    | Grand Canary | ... 46·3 | ... 49·5 |
| 29             | ... 20  | ...    | Teneriffe    | ... 46·4 | ... 49·2 |
| 30             | ... 20  | ...    | Gomera       | ... 48·0 | ... 47·6 |
| <hr/>          |         |        |              |          |          |
| Total          | . 91    | ... 58 | Averaged     | . 46·9   | ... 48·7 |

*The orbital indices.*

| No. of skulls. |         |        | Island.      | Indices. |          |
|----------------|---------|--------|--------------|----------|----------|
| Male.          | Female. |        |              | Male.    | Female.  |
| 32             | ... 18  | ...    | Grand Canary | ... 75·6 | ... 77·1 |
| 29             | ... 20  | ...    | Teneriffe    | ... 77·4 | ... 74·7 |
| 30             | ... 20  | ...    | Gomera       | ... 75·6 | ... 75·4 |
| 8              | ... 11  | ...    | Hierro       | ... 74·6 | ... 73·3 |
| <hr/>          |         |        |              |          |          |
| Total          | . 99    | ... 69 | Averaged     | . 75·8   | ... 75·1 |



“With regard to the skeleton, the various crests and tubercles are well developed; in the case of the femur the *linea aspera* tends to form the *fémur à colonne* of the French anatomists. There is a certain amount of platycnemia of the tibia; the fibula shows some degree of channelling on the anterior surface, and the ridges on the other long bones are well developed. In the forearm the sigmoid cavity of the ulna forms a great curve, and the difference between the beaks of the olecranon and the coronoid processes is so diminished that the olecranon fossa of the humerus and the corresponding coronoid fossa are traversed by a foramen. Out of 630 humeri 130 were perforated, and when not perforated the septum between the two fossa was very delicate. The facets of the tarsi are very oblique, especially in the cuneiform bones, thus giving a higher curve to the arch of the foot.”

Possessing these physical characteristics, yet ignorant of metals, of a written language, of the use of a potter's wheel, of the art of spinning, of building with stone or wood—troglodytes and deists, possessing a knowledge of and practising embalming, burying their dead in cairns or caves—are peculiarities which stamp this people as being the descendants of a primitive race who, owing to their isolated position, made no advances in civilisation.

The perforation of the olecranon fossa was a common character in ancient races. Darwin, in his ‘*Descent of Man*,’ 2nd ed., p. 22, states that “it is remarkable that this perforation seems to have been present in man much more frequently during ancient times than recently.” Topinard, in his work on ‘*Anthropology*,’ p. 298, states that “the perforation of the humerus as a common character dates from the polished stone period, and that it was frequent at that period, that it has continued among people placed in conditions unfavorable to interbreeding, and it has diminished in frequency since the commencement of our era.”

From his work I have arranged the following table, the Guanche statistics being taken from Chil.

| Number of humeri. |     | Origin.                                                                | Percentage of perforation. |
|-------------------|-----|------------------------------------------------------------------------|----------------------------|
| 630               | ... | Guanehe . . .                                                          | 20·6                       |
| 368               | ... | Dolmens of La Lozère . . .                                             | 10·6                       |
| 66                | ... | Caverne de l'Homme Mort . . .                                          | 10·6                       |
| 128               | ... | Stations of Vauréal, Orrony, and Chamans (polished stone period) . . . | 21·7                       |
| 44                | ... | Pregallic stations of Campans . . .                                    | 12·5                       |
| 200               | ... | Parisians of the 4th to the 10th century . . .                         | 5·5                        |
| 218               | ... | „ „ middle ages . . .                                                  | 4·1                        |
| 150               | ... | „ before 17th century . . .                                            | 4·6                        |

The peculiarities met with in the tibia, femur, and fibula have been also noticed in the skeletons of pre-historic tribes of Western Europe, but Topinard remarks that these conditions are rarely met with in those races that possessed the perforation of the olecranon fossa, and states, "The two races that have bequeathed to us the two varieties are therefore distinct." This, however, does not appear to hold good in the Guanche race, though the platycnemia is not marked in character.

Some of the skulls are found to be artificially perforated with a clean round hole. According to Jolly, in his 'Man before Metals,' these perforations are found in skulls from the burial cairns of La Marne, Lourdes, in the neighbourhood of Pau, in the dolmens of Algeria, and in those of the Canary Islands.

The cranial capacity is not given by Chil, but Topinard, from measurements made on twenty skulls estimates it at 1557 cub. cent. for the men, and 1353 cub. cent. for the women.

Comparing this with other skulls :

| Skulls. |                                   | Men.      | Women.    |
|---------|-----------------------------------|-----------|-----------|
| 18      | ... Caverne de l'Homme Mort . . . | 1606 c.c. | 1507 c.c. |
| 69      | ... Gauls . . .                   | 1599      | 1426      |
| 60      | ... Basques . . .                 | 1574      | 1356      |
| 20      | ... Guanehes . . .                | 1557      | 1353      |
| 28      | ... Corsicans . . .               | 1552      | 1367      |
| 85      | ... Negroes (West Africa) . . .   | 1430      | 1251      |
| 18      | ... Australian Aborigines . . .   | 1347      | 1181      |
| 21      | ... Nubians . . .                 | 1329      | 1298      |

The craniometrical measurements indicate that the Guanche race were a dolicocephalic, orthognathic, leptorrhinic, and microsemic race.

*The microsemic character* of the orbits shows they were not negroid (index, 104) nor mongolian (index, 107), but the index of 75 is near that of the skulls from the Caverne de l'Homme Mort (81.9) which belong to the polished stone period, the skull of the old man of Cromagnon having even a lower index, but this type was more prognathic, and is supposed to have been of a much more ancient date.

*The leptorrhinic character* of the nasal index (Chil gives it 47, Topinard 44) also separates this race from the negroes, whose indices range from 53 to 58.

*The orthognathic character* of the face further differentiates this race, as the projection (prognathism) is slighter than in any other race. Thus their gnathic index is represented by 81.3, the skulls from the Caverne de l'Homme Mort by 79.7, the Fins by 75, the Chinese by 72, the Australian aborigines by 68, the negroes of West Africa by 66.9, and the bushmen, the supposed aborigines of Africa, by 59.5.

*The dolicocephalic character* of the skull identifies this race still further with those of the polished stone period. For towards the close of this period western and southern Europe were peopled by a long-headed dolicocephalic race possessing a very slight degree of prognathism. I have given in the following table a list of the cephalic indices of various races, ancient and modern, that possess this dolicocephalic type; naturally this type merges into the brachycephalic, of which a few indices are appended.

| Number. | Type of skull.                                 | Indices. |         |        |          |          |
|---------|------------------------------------------------|----------|---------|--------|----------|----------|
|         |                                                | Cephalic | Height. | Nasal. | Orbital. | Gnathic. |
|         | Long barrow skulls of Britain . . .            | 71.2     | ...     | ...    | ...      | Ortho.   |
| 18      | Caverne de l'Homme Mort . . .                  | 73.2     | 73.0    | 45.4   | 81.9     | "        |
| 50      | Guanche de Grand Canary . . .                  | 73.0     | 73.0    | 47.0   | 76.0     | "        |
| 19      | Troglodytes of La Marne (polished stone) . . . | 73.2     | ...     | ...    | ...      | "        |
| 6       | Cromagnon (stone period) . . .                 | 73.3     | ...     | ...    | 81.2     | " ?      |
| 11      | Berbers . . .                                  | 74.6     | ...     | ...    | ...      | "        |
| 54      | Dolmens of North Paris (polished stone) . . .  | 75.0     | ...     | ...    | ...      | "        |
| 81      | Ancient Egyptians . . .                        | 75.5     | ...     | ...    | ...      | "        |
| 81      | Merovingeans . . .                             | 76.3     | ...     | ...    | 81.2     | "        |
| 12      | Modern Egyptians (Copts) . . .                 | 76.4     | ...     | ...    | ...      | "        |



| Number. | Type of skull.                                   | Indices. |         |        |          |          |
|---------|--------------------------------------------------|----------|---------|--------|----------|----------|
|         |                                                  | Cephalic | Height. | Nasal. | Orbital. | Gnathic. |
| 60      | Spanish Basques . . . .                          | 77.4     | ...     | ...    | 83.9     | "        |
| 49      | Guanches, Teneriffe . . . .                      | 78.0     | 71.0    | 47.0*  | 76.0     | "        |
| 44      | Troglodytes de la Marne (polished stone) . . . . | 78.0     | ...     | ...    | ...      | "        |
|         | Peruvians . . . .                                | 78.7     | ...     | 50.2   | 93.1     | Prog. ?  |
| 95      | Round barrow skulls of Britain . . . .           | 81.0     | ...     | ...    | ...      | Prog.    |
| 88      | Auvergnians . . . .                              | 84.9     | 73.8    | 46.1   | 86.5     | "        |
|         | Croats, Slavs, Poles . . . .                     | 83.5     | ...     | ...    | 84.3     | "        |
|         | Ligurian, Disentis type . . . .                  | 86.5     | ...     | ...    | ...      | "        |
| 84      | Negroes, west coast of Africa . . . .            | 72.4     | 73.4    | 54.7   | 85.4     | "        |
| 16      | Hottentots . . . .                               | 73.4     | ...     | 56.3   | 83.6     | "        |
| 27      | Chinese . . . .                                  | 83.5     | 77.2    | 48.5   | 93.8     | "        |

The dolicocephalic-orthognathic type is distinctive of an ancient race who, in prehistoric time, inhabited western Europe and the shores of the Mediterranean Sea. They were, for the most part, troglodytes, living in caves, leading a nomadic life, unacquainted with the use of metals, and were succeeded in the history of races by a stronger, more brachycephalic, more prognathic people—the remote ancestors of the old Celtic type of race. This dolicocephalic race originally inhabited Belgium, France, Spain, and were identical with the long barrow people of Britain who were contemporaneous with the polished stone or neolithic period; they are now included under the generic term of the Iberian race. Remains of this Iberian race are found not only in these countries, but also in Corsica, Sardinia, southern Italy, and Sicily. Old writers like Seneca state that Corsica was peopled by the Ligurians and Iberians. Pausanias wrote that the Sardinians were Lybians, a people whose existing representatives are the Berbers. From Thucydides and Ephoros it is gathered that the oldest inhabitants of Sicily were Iberians. Remains of this same race have been found in the excavations at Hipparlie by Schliemann underlying the Hellenic remains, they were therefore a pre-Hellenic race which was overwhelmed by a stronger brachycephalic one.

\* Topinard gives this index as 44.2.



The greatest of modern anthropologists, Broca, considers that the resemblance of the Iberian race to the Berbers shows that they immigrated from Africa into Europe, whilst the resemblance of the Guanche skulls to the skulls of the Berber and the ancient Egyptians, allies them to the great Hamitic stock. It has been supposed that the only representatives of this Iberian race existing at the present time are the Spanish and French Basques of the Pyrenees.

From all the anatomical peculiarities—the dolicocephalic-orthognathic skull, the platycnemic tibia, the *fémur à colonne*, the perforated humerus—it is impossible to conclude otherwise than that the old Guanche stock was descended from a prehistoric race that, under the name of the “Iberians,” inhabited western and southern Europe and northern Africa. Originally they migrated from the mainland, and, owing to their insular position, they were practically unknown and isolated for centuries, with the result that they were able to retain their racial individuality. When the Spanish buccaneers landed on the islands the inhabitants were living in a stone age, and the fact that the invaders were received with great curiosity, with no sign of fear, points to the probability that the natives were unaccustomed to come into contact with other nations.

The inhabitants of Teneriffe were more advanced than those of the eastern islands; their colour was lighter and their hair was not so dark, especially in the north of the island; and their crania was more brachycephalic; their pottery was more artistic and finer, and their language differed somewhat. The Marquis of Bute considers that there are decided Aryan elements in it, although the root of the language points in the direction of the Berber theory as regards a Coptic origin. Here tradition steps in and perhaps throws some light on the subject. It tells us of ancient settlements of a fair-haired, tall people at Taganana and Icod on the north slope of Teneriffe. It is more than probable that these colonists were a brachycephalic, prognathic people, speaking an Aryan dialect, who impressed their linguistic and physical peculiarities on the original dolicocephalic race, and thus account for the marked difference noticed by the earlier

navigators between the aborigines of Teneriffe (especially of the north side) and of the eastern islands nearest the African continent.

Explorers in those days sailing from the north, running before the prevailing winds, would be attracted by that most striking object in these latitudes, the peak of Teneriffe, towering up 12,000 feet, covered with snow, and perhaps with one of the numerous craters in eruption. In connection with this it is interesting to note that the majority of the stone tablets ascribed to the ancient Phœnicians have been found in the western islands.

Emigration from the mainland could be easily accomplished by open boats, first to the eastern afterwards to the western islands, and in this manner the first migrations most likely took place.

But I extremely doubt if any of the fair-haired type came by this route or that they had any relation to the blonde type of the Berbers who were then, as now, scattered through Tunis, Algeria, Morocco, and the Sahara. According to that theory the probabilities are that this fair-haired type would have been more numerous in the eastern islands as being nearer the mainland; but, on the contrary, the aborigines of these islands were darker and were not so advanced in civilisation as those of Teneriffe. Again, this blonde type found scattered over northern Africa are not otherwise distinguished from their swarthier neighbours; they are supposed to be derived from the Tamahou people who not later than seventeen centuries before our era made their appearance in Spain and Italy, coming from the north, driving the Iberian race southward out of Europe, and, finally, extending their invasions to the western frontiers of ancient Egypt.

There is also a theory that the Guanche race was allied to the ancient Peruvians; this is founded on the fact that both nations embalmed their dead, and also that there was some supposed resemblance in the languages. But their cranial characteristics differ far too widely to allow of such a theory. The cephalic index is midway between the Mongolian and the Guanche, while the nasal and orbital indices ally them

much more closely to the Mongolian than the Guanche type.

The affinity of these two races will have to be sought through Africa, through Asia, across to America, and not across the Atlantic Ocean through a submerged Atlantis.

## WORKS CONSULTED.

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### Consular Reports on Canary Islands.

|                                           |   |   |   |                      |
|-------------------------------------------|---|---|---|----------------------|
| Madeira and the Canary Islands            | . | . | . | <i>Samler Brown.</i> |
| Teneriffe and her Six Satellites          | . | . | . | <i>Stone.</i>        |
| Estudios Historicos de las Islas Canarias | . | . | . | <i>Chil.</i>         |
| Vega de San Matteo                        | . | . | . | <i>Leon.</i>         |
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